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MOTORSHIP

Devoted to Marine Oil Engine and Motor Vessels

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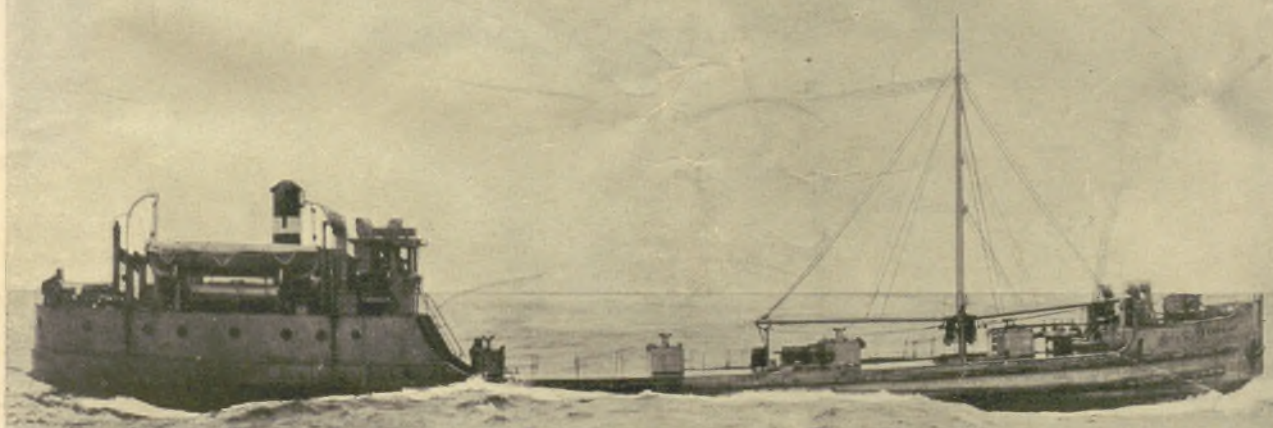
DIESEL MARINE ENGINES
FOR ALL CLASSES OF SHIPS



McINTOSH & SEYMOUR CORP.
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EXCLUSIVE technical and non-technical articles on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.

MOTORSHIP

PROFUSELY illustrated with photograph c reproductions of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.

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Vol. VIII New York, U. S. A., February, 1923 No. 2

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Conversion of Shipping Board Vessels to Diesel Power

Idle Ships to Be Disposed of at Very Attractive and Specially Low Prices Provided Existing Steam-Machinery Is Removed — Important Conference of Shipbuilders and Oil-Engine Manufacturers Called by Admiral Benson to Work Out All Problems Concerning the Installation of Diesel-Engines

AT last the Shipping Board has come to a full realization of the fact that hundreds of steam-driven vessels of various types built under the Hurley regime will never go to sea with their present machinery, and that the only hope of their being purchased and operated by private American shipowners is to tear out the existing power plants in such hulls as are of substantial construction and good condition, and replace the same with economical oil-engine or Diesel-electric drive. We believe that legally the Board could convert at least one vessel of each class and put them forward as typical models to be followed, and at the same time lay all the facts and figures relating to the constructional work and its cost before all shipowners interested in buying similar hulls with this conversion object in view.

But, apparently the Board is a little chary in doing this, and possibly its past constructional record may have some influence on the present Administration. Undoubtedly Chairman Lasker and his Commissioners prefer to offer these vessels at such an attractive price that it will be cheaper to buy them under a guarantee of conversion than to purchase and operate them as is. Meanwhile the Board's engineers are in cooperation with the leading Diesel and oil-engine builders of the country working-out all the necessary technical data dealing with the structural and mechanical changes.

To this end Admiral W. S. Benson, commissioner of the Board, called together at Washington, officials of a number of important ship-building and oil-engine building firms—the first meeting being held on November 16th, the second on December 13th, while the third meeting will be held very shortly in Philadelphia.

In charge of this work under Admiral Benson is his assistant, Capt. Charles S. Bookwalter, and Mr. A. Conti, who was formerly manager of the Technical Division of the Fleet Corporation, and who recently returned from Europe where he made a study of Diesel-engine and motorship construction. Officials of the following firms attended:

Wm. Cramp & Sons Ship & Engine Building Company.
Sun Shipbuilding Company.
Newport News Shipbuilding & Dry Dock Company.
Todd Shipyards Corporation.
Morse Dry Dock.
Merchant Shipbuilding Company.
New York Shipbuilding Corporation.
McIntosh & Seymour Corporation.
Busch-Sulzer Bros. Diesel Engine Company.
Ingersoll-Rand Company.
Westinghouse Elec. & Mfg. Company.
General Electric Company.

What Chairman Lasker and Admiral Benson Said!

Admiral Benson:—My idea is to get the talent of the country here in order to discuss what I consider the most important constructive elements in our Merchant Marine development. I think there can be no question in our minds that we have got to adopt the internal-combustion engine for our merchant ships, or we are going to be left behind. The Board has approved of my idea as a policy, that is, we will sell our ships to firms who will take them and install Diesel engines and will sell them at such cost that when the shipowner starts to sea with the Diesel equipment he will be at a decided advantage from a capital cost from the foreign shipowner who also has Diesel equipment.

I intend to exhaust every possible means to aid in this development. If I can establish a differential such as a blind man can see that it is better to install Diesel engines than to operate under steam—I am going to do it! It is a fact that the internal-combustion engine as motive power for ships is going to take the place of the present type in the world's commerce. There can be no question about it, it is a self-evident fact!

My absolute belief is that the future success of the American Merchant Marine depends very largely on the rapidity with which we can improve motive power in our ships and their auxiliary power, through the adoption of the internal-combustion engine. In order to help expedite this and realize the accomplishment of this object, the Board is willing to sell ships to American firms at special terms who install the Diesel engine or modified Diesel engine. At the meeting of the Shipping Board Chairman Lasker has just said that in his opinion five years from now any man who was attempting to operate ships that were not Diesel or modified Diesel-driven, would have to go out of business. This is just a business man's view of the situation and I think the Chairman is correct. While he is not a technical man or a ship operator, he is a clever shrewd business man!

Also by mutual consent the magazine MOTORSHIP was represented by Russell Palmer, general manager of the Miller Freeman Organization's eastern publications.

When nearly two years ago MOTORSHIP published an article entitled "Sink a Thousand Ships," it was considered somewhat sensational. Since then shipping men have realized it was really valuable recommendation and contained more common sense than it appeared to have, and these sentiments have since been re-echoed in many parts of the country. But, it is doubtful if public sentiment of the country would stand for such wholesale construction in the same way as there was difficulty in the way of destroying the wooden ships wholesale.

Consequently, the most practical thing that can be done to-day to put our Merchant Marine on a sound commercial basis is laid-out in the board's new policy, namely, to take all the hulls that are well-built and in sound condition and virtually give them away to shipowners who will agree to convert them to Diesel power. Under the law these ships cannot be actually given away, so the Board has fixed a price varying from $5 to $7 per ton, according to the class of the vessel, leaving it to shipowners to build new, modern and efficient motorships to meet certain trades as occasion arises for their need with the increase of overseas transportation, such as will come with the bettering of business conditions throughout the world following settlement upon economical policies by all leading countries.

When the Jones' Bill passed into law two years ago it contained a clause empowering the Board to set aside twenty-five million dollars ($25,000,000) each year for the purpose of building new oil-engined motorships. Unfortunately, although MOTORSHIP made efforts at the time, the bill was passed without a clause empowering the Board to also use this money for conversion of steamships to more economical power. In the new Shipping Act there is such a clause, but at the present time it is uncertain as to whether the bill itself will pass through the Senate. In this case steps will be taken to modify the present shipping act to enable this money to be used for the purpose.

At the first of these meetings Admiral Benson stated that a bill has already been introduced into Congress for the purpose of obtaining this authority, but of course, the Board itself cannot take steps to influence legislation to this end, and he indicated that there is no reason why this committee of shipbuilders should not take the necessary steps to induce Congress to make the money available for this important and urgent purpose.

According to a recent statement by Chairman A. D. Lasker contained in a letter to Senator Wesley L. Jones, the Shipping Board actually has $25,000,000 (twenty-five million dollars) in its treasury for the purpose of constructing new motorships. This

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statement was published on page 843 of the November 1922 issue of MOTORSHIP. Whether or not the Board at the present moment has this full amount we are not certain, but we do know that there is an excess of $10,000,000 (ten million dollars) available in the Board's treasury, which under the present law can be loaned at two per cent up to two-thirds of the value of the new ship. A slight modification will enable this available money to be loaned at 2 per cent for covering the total value of the conversion, the shipowner providing the necessary $5 to $7 per ton for the hull he will buy. However, there is a possibility that only two-thirds of the commercial cost will be obtainable on loan. This is indefinite at this time.

If a shipowner purchases one of these steamers "as is," he will be obliged to pay from $30 to $35 per deadweight ton, but he will realize that to do so under the circumstances would be foolish, for the following reason:

Take the case of an 8,800 tons vessel. The initial cost of this ship at $5 per ton will be $44,000. To convert her to Diesel power will cost about another $30 per ton including new electrical deck machinery for replacing the old steam winches, and including overhauling the hull. Thus the total cost of the ship when converted will be $308,000. Allowing another $17,000 for contingencies we get a total cost to the shipowner of $325,000 or just under $37.00 per deadweight ton. Interest charges on this will be 6 per cent on the cost of the hull, that is to say $2,640 per annum, and 2 per cent on the balance is $5,620. Consequently, the total interest on the capital charge would be $8,260.

On the other hand if he buys an 8,800 tons steamer as is, the shipowner probably will have to pay the banker 6 per cent on the total amount, or charge it up to their own books at that interest. Let us assume that the Board sells the steamer at $30 per ton. It will cost another $10 per ton to overhaul her in order to put the vessel into sea-going condition. Therefore the cost of the vessel will work out at $352,000 while the interest on the capital charge is $21,120 per annum, or $12,860 more than the interest on the converted job. While this is not such a big item, added to the fuel economy, extra carrying-capacity, reduced wages, etc., resulting from Diesel or Diesel-electric drive, the saving will be a very considerable amount and will run into close upon six figures per annum. On the other hand if the present legislation is not modified, the shipowner probably will have to pay about 6% interest on the capital charge of $325,000 for the motorship.

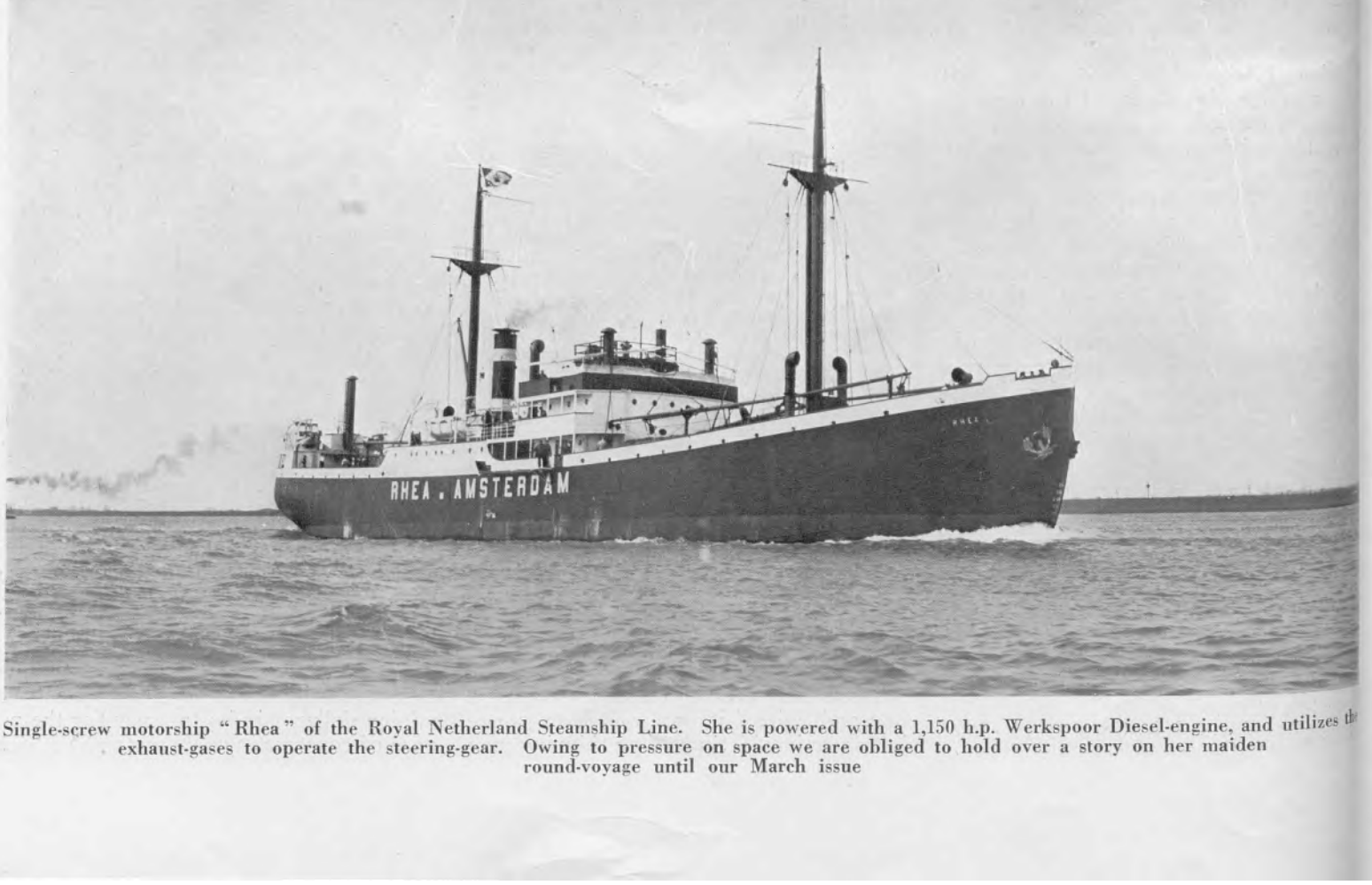
> In my opinion five years from now any man who attempts to operate ships that are not Diesel or modified Diesel driven will have to go out of business.
>
> A. D. Lasker
> Chairman U. S. Shipping Board
> Washington, D. C.

At the present time a complete list of vessels which will be sold under this arrangement is now being made up by Capt. Bookwalter and Mr. Conti, while the Builders' Committee is working on conversional plans for each individual class of ship, and at the same time endeavoring to standardize as far as possible the various equipment other than the engines that will be used for the conversion, and will make recommendations accordingly. In this manner it is hoped to bring the cost of the conversion to a minimum figure, making the whole proposition highly attractive to shipowners. It is expected that following the third meeting to be held in Philadelphia all the d will be available to shipowners. It is a to be hoped that either the new subs bill will become law or else legislation passed modifying Section Eleven of existing Shipping Act.

Attention is particularly drawn to statements of Chairman Lasker and A miral Benson, which are given on one these pages. They clearly outline the sit tion as is presented to-day. Because the high cost of operating steamships competition with economical foreign mot ships and foreign steamships operated lower wage bills, and because the new S sidy Bill is in a doubtful position, shipp men of the country are becoming disco aged, and are afraid the country will dropping back to its old position of n importance in the maritime field. Howe the prospects of converting these ships der such favorable conditions brings a of sunlight into the situation and off clarified and encouraging aspects.

Opportunity is now offered to shipown to have very shortly a fleet which can be in competition with vessels abroad. oil-engine constructional facilities of country are amply capable of supplying chinery for conversion of the entire t hundred vessels and of course, the big e tric and equipment companies can t care of all the new auxiliary machinery. some cases part of the steam auxiliaries possibly be left in and exhaust-gases utili for their operation at sea, such as the ste ing-engine and lighting-set, while retain all the steam auxiliaries may be a saving first cost we cannot recommend it as be economical for a definite period.

It is our strong recommendation t every shipowner converting any of th vessels should boldly absorb the additio first cost and tear-out all the existing stea winches and replace them with electr winches. However, it may be advantageo to retain one of the boilers and make so



Single-screw motorship "Rhea" of the Royal Netherland Steamship Line. She is powered with a 1,150 h.p. Werkspoor Diesel-engine, and utilizes th exhaust-gases to operate the steering-gear. Owing to pressure on space we are obliged to hold over a story on her maiden round-voyage until our March issue

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minor changes in order to utilize, as just stated, the waste exhaust-gases from the main Diesel engines. This will enable the steam steering-gear to be retained. As the latter is only in use when the main engines are in operation there will be no necessity of maintaining steam-pressure by oil-firing when in port, except in the winter time for heating.

In this manner the fuel-consumption for auxiliaries at sea will be practically nil, while when the vessel is in port it will not exceed half-a-ton per day, except in winter time when steam heat for the ship may require another half-ton. At the meeting Admiral Benson expressed himself as being very strongly in favor of installing electrical-deck machinery. In fact, he is in favor of Diesel-electric propelling machinery as well in many cases.

As it happens, to-day's fuel-oil situation is one which will foster this conversion because large quantities of suitable Diesel fuel-oils are available to-day at very reasonable prices, rendering it unnecessary for any vessel converted to use the very heaviest of boiler oils; although, of course, every ship when converted should be fitted with a heating device enabling 14 and 16 degrees Beaumé oil to be used whenever necessary.

Too much stress cannot be placed upon the fact that many of the steamers purchased as is will only have a useful life of about ten years, whereas reconditioned motorships will be almost equivalent to new vessels with a life of twenty years.

Two Years Operation of the "Nourmahal"

Vincent Astor's Winton Diesel-Propelled 160-Footer Has Proved All-Round Success—Has Run Over 16,000 Nautical Miles Without a Mishap

OIL-ENGINED yachts as constantly featured in our pages are rapidly becoming the accepted type of pleasure craft for yachtsmen who formerly enjoyed life afloat on steam and gasoline-yachts. The advent of the Diesel-driven yacht has brought appreciation of the economical and other advantages of oil-engine power, and these have so impressed themselves upon yachtsmen that this system has also been adopted by men possessing the means to build and operate the most expensive craft. These wealthy men have adopted oil-engine-drive because of its intrinsic merits, i. e., long cruising radius, safety, reliability and economy of operation.

Although MOTORSHIP has published numerous articles on the operation of merchant motor-vessels, we have not previously dealt with the service of a large motor-yacht over a substantial period of time. We believe that yachtsmen in general will be considerably interested in the working of a vessel of this class. For this purpose we have selected Vincent Astor's 160-footer NOURMAHAL because she has had more use than the average craft of this class. Incidentally, her operation will do much to encourage the adoption of oil-engine power among other yachtsmen because she has given such excellent service and has been a source of complete satisfaction to her owner.

Although one of the first of the large craft of her type, the NOURMAHAL embodies a combination of beauty of form and furnishings, with rugged construction and a well-built power plant. One could conceive of no more pleasing floating home than is the NOURMAHAL, and upon our recent trip especially arranged for the Editor of MOTORSHIP by Mr. Astor we received a very favorable impression of this beautiful craft.

To refresh our readers' memories we will mention at this point that the NOURMAHAL was constructed of steel in the spring of 1921 by Robert Jacob in his yard at City Island, New York, from designs by and under the supervision of Cox & Stevens, naval architects of New York, while her oil-engines were built at the Winton Engine Works, Cleveland. Other men and firms responsible were Charles A. Platt, the Hampton Shops, and the many other leaders in their various lines of endeavor. The NOURMAHAL represents the large motor-yacht, a craft which few could afford to operate extensively if powered with gasoline-engines, and she is a craft which embodies even better accommodations than the larger steam yacht NOMA, formerly used by Mr. Astor. Her particulars are as follows:

Length, o. a.	160′ 0″
Breadth	25′ 0″
Draft	10′ 0″
Horse Power	700 h.p.
Engines	Winton Diesel
Average Speed (actually maintained)	12.4 knots
Cruising Radius	6,000 naut. miles

Her general arrangement is well illustrated in the accompanying reproduction of the designs of the NOURMAHAL, available through the courtesy of Mr. Astor and of the designers. The compact machinery arrangement and the small space occupied by fuel permits most comfortable and convenient living accommodations for the owner and guests, a further convenience being the ability to pass from any room to any other without going out on deck.

Perhaps the most outstanding feature of this yacht is the excellent service rendered to Mr. Astor. As a source of pleasure, ready at any time for service at a few moments notice, and affording reliable means of enjoying life afloat the NOURMAHAL has never failed. Many a motor-yacht unfortunately delays her owner's outings afloat, but such has not occurred in the case of Mr. Astor's yacht; she has always been ready, not only for her usual service between New York and Mr. Astor's summer home at Newport, but for long ocean voyages made with perfect safety and comfort. Since going into commission after her trial-trip on July 14, 1921, she has run 16,092 nautical miles without a moment's delay. Any slight adjustments and the routine overhauling of her machinery have been attended to without ever delaying Mr. Astor when he called on her services.

Hand in hand with this reliability has been the satisfaction of knowing that long ocean voyages can be made on one bunker-

M. Y. "Nourmahal," Vincent Astor, Owner

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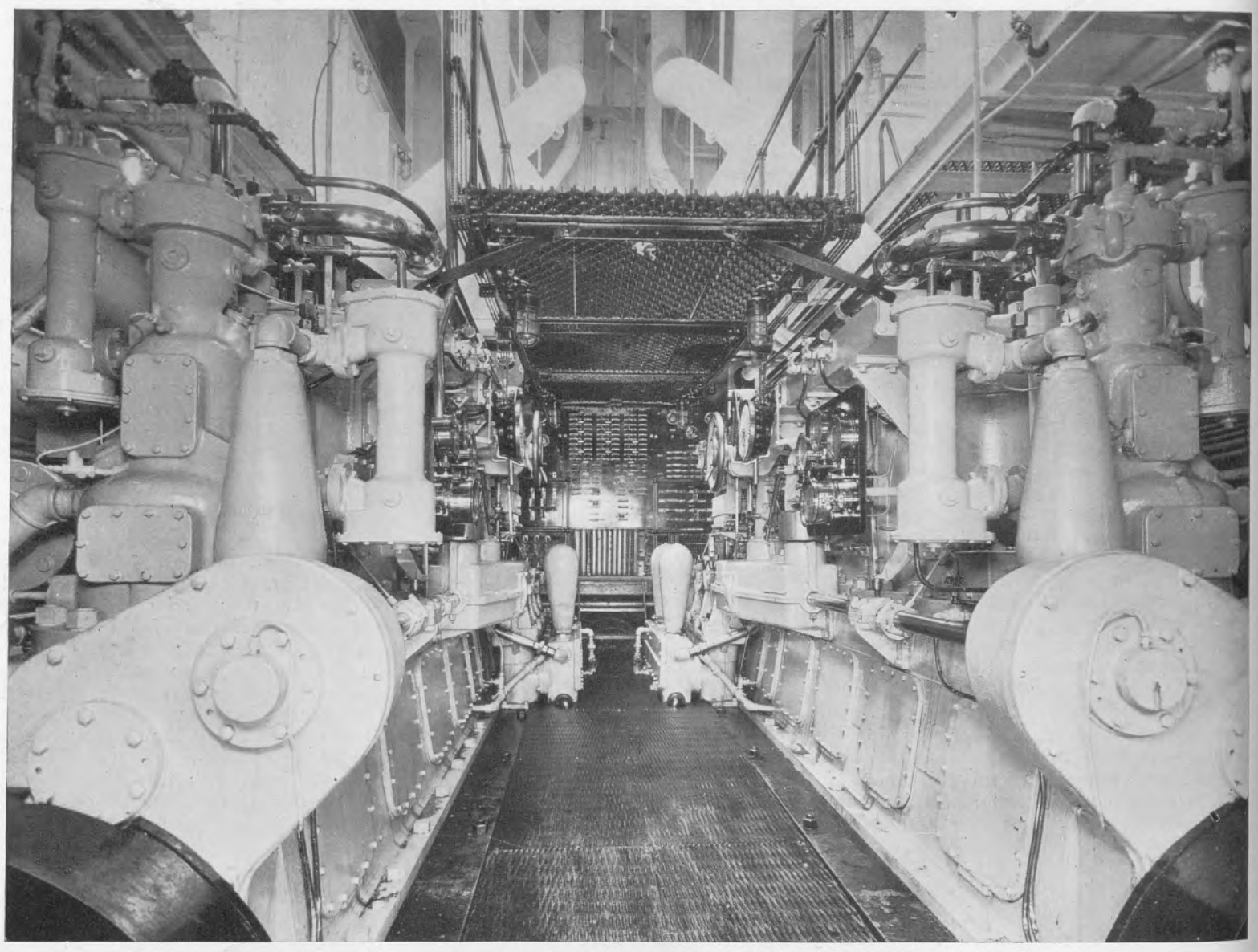
ing of fuel without the nuisance of owner and guests breaking their pleasure-trip while additional fuel is bunkered, also that the voyage is made in perfect safety. The importance of a cruising radius of 6,000 nautical-miles possessed by the NOURMAHAL cannot be overestimated as it has rendered possible long yachting trips—one of them being to the West Indies and return—without taking aboard additional fuel. This voyage was made in the fall of 1921 and Chief-Engineer Leslie W. Drysdale advises us that the fuel-supply of 16,000 gallons was sufficient for the non-stop run from New York, N. Y., to Cuba, thence to Haiti and Jamaica and the non-stop return voyage from Port Antonio, Jamaica to New York, a voyage without a delay. The fuel-consumption is only 32 gallons per hour at 12 knots. The NOURMAHAL'S Winton Diesel-engines as well as every item of mechanical equipment have performed to the full satisfaction of Mr. Astor, Captain Gustave Klang and Chief-Engineer Drysdale. Such service is, needless to state, gratifying and conclusively proves the advantages and reliability of oil-engine power. Furthermore, it evokes interest in the details of the installation which has made this service possible. One thousand, three hundred and forty-one hours of service from the time she was placed in operation in 1921 until she temporarily went out of commission at the end of the summer of 1922, when Mr. Astor went to Europe, indicates somewhat more than the usual length of service for motor-yachts, whose trips as a rule are short and occasional.

Her propelling-engines are two six-cylinder $12\frac{15}{16}$" by 18" four-cycle Winton Diesel-engines of 350 brake h.p. each, developing their rated power at 225 r.p.m. These engines are of the reversible type driving three-blade bronze propellers of 5' 9" diameter, 6' 10" pitch at 250 r.p.m. maximum or 220 r.p.m. cruising speed. Of the trunk piston design these Winton Diesel-engines are of the type found so suitable for installation in motor-yachts because of freedom from vibration, suitable weight and of revolutions which permit propellers of most effective design for yacht work. Coupled with these advantages is the further desirable feature of almost noiselessness of machinery operation, to the naturally quiet performance of the engines being added the sound-effacing effect of interposing the fuel-oil tanks between the engine-room and the accommodations both forward and aft of same.

On entering this engine-room one receives the impression of being in a compartment much larger than it actually is, for there is wide floor area around each main engine and the auxiliary machinery is grouped compactly, yet with ample accessibility to all parts. Its dimensions are only 30' by 25'.

Indeed, we often wonder if some of the satisfactory performance of machinery is not due to the fact that it is installed in such a manner that the engineer can give it proper attention. In the NOURMAHAL en gine-room all auxiliaries of the same char acter are grouped together, tending towar minimum loss of time in attending to them as for instance, when pumps are being op erated the various valves are found withou going about the engine-room as if ofte necessary.

At the forward end of the engine-roo is a well equipped work-bench arranged fo storage of tools and spare parts underneath and a 350-gallon lubricating-oil tank over To port of this bench is a short iron stair way leading to a watertight steel door open ing into the officers' and crew's quarter located in the forward end of the boat, th latter being under the forward deck, whil



M. Y. "Nourmahal," the engine-room showing twin Winton Diesels

the former are under the forward end of th deck-house. The chief-engineer's room i thus in close communication with the en gine-room. Under the above mentione stairway in the engine-room is a Westo sanitary-pump maintaining a supply of ho and cold running water at 30 lbs. pressur

Immediately to port of the stairs, in th corner, is a Boynton hot-water heater sup plying radiators throughout the yacht quarters. Passing aft along the port sid of the engine-room we find a group o pumps, there being a 2½" Kinney fire pump driven by a 3 h.p. Triumph electric motor, a vertical Thomas sump-pump driven by an Eck electric-motor, a 3/4 Thomas pump for emergency circulating water system (which, however, has never been used) and a 3" Kinney bilge-pump, a

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M. Y. "Nourmahal," the lounge

electric driven. Aft of the pump equipment we find a 7½ k.w. Winton generating-set, near which an iron ladder leads to the upper grating and the main-deck. In the aft corner of the engine-room on each side is a 25 k.w. General Electric generating-set operated by a kerosene engine. One of these sets is to be replaced by a 20 k.w. Diesel driven generator using the same fuel as the main engines.

Extending athwartships between these sets is an iron grating over the shaft coup-

M. Y. "Nourmahal," the smoking-room

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M. Y. "Nourmahal," the dining saloon

M. Y. "Nourmahal," the owner's stateroom

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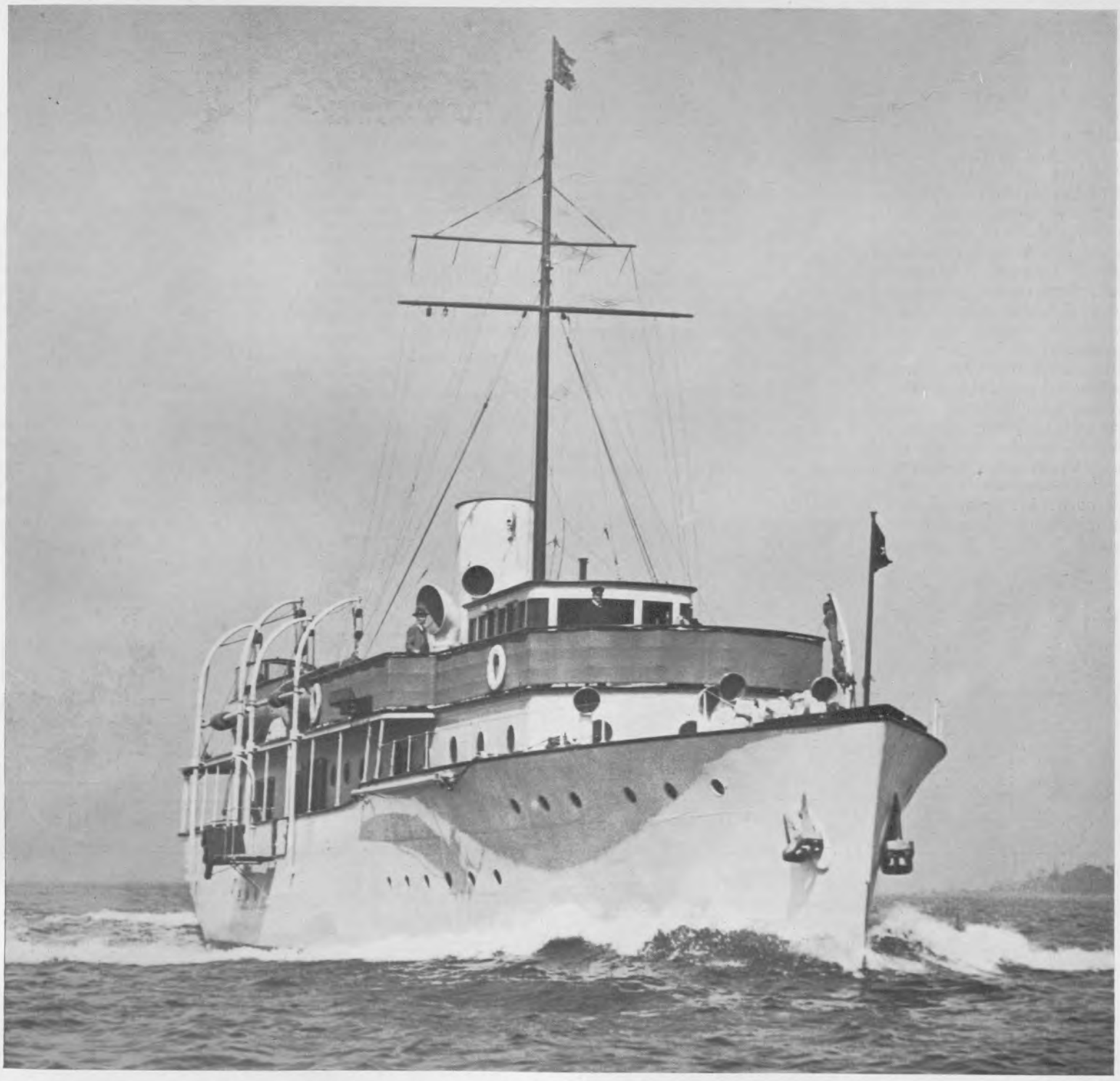
lings of the main-engines and on the aft engine-room bulkhead is a 6 ft. by 8 ft. switchboard installed, as was the entire electrical equipment, by Smith-Meeker Engineering Co. of New York. On this board are several complete circuits for the lighting and power lines of the boat, these being controlled by Weston Electric meters, General Electric circuit-breakers, Cutler-Hammer rheostats and Ward-Leonard control-system. One feature of the electrical installation worthy of note is the provision of a separate steel room on the main-deck for 300 ampere-hour Edison storage batteries, this room being directly over the generating-sets on the port side so that cables are led directly into this room. By thus segregating the storage-batteries all fire risk is avoided, an important item toward perfect peace of mind on this score.

Again going back to the engine-room, we find on the starboard side passing from the generating-set forward the lubricating-oil filter-tanks and a 1″ Kinney fuel-oil transfer-pump, air-bottles overhead and two Winton auxiliary air-compressors equipped with 12 h.p. Imperial motors immediately forward of the filter-tanks. In the forward starboard corner is the one-half ton Clothel ice-machine driven by a 2½ h.p. Crocker-Wheeler electric-motor. At the aft end of the engine-room on the upper grating is located a hot-water heating system for supplying the owner's quarters with hot water by means of a 100-gallon tank heated by an oxo-gas burner installed by the General Gas Appliance Co. of New York. Four 125-gallon kersosene tanks for supplying the engines driving the auxiliary generators are slung under the engine-room roof, while also overhead travelling on heavy I-beams is a Yale one-ton chain hoist.

Assisting in maintaining the engine-room at a comfortable temperature Sirocco blowers connected with the ventilating-cowls. These lead close to the upper grating between the engines, carrying a current of fresh air into the center of the room. The exhausts of all the engines are led to the stack through a single piece of heavy steel pipe heavily lagged with asbestos rope and magnesia, no water-cooling being used and no over-heating having taken place. Controls for the engines are near the center of each, the Cory telegraphs being conveniently located on either hand. This engine-room telegraph system was installed by Chas. Cory & Son of New York, one feature being the position of the recording instruments at the level of the engineer's eyes, it not being necessary to constantly look up high to note signals and then down again to the control-levers as we find in many installations. On the stack are found an air-whistle and a Typhon horn, the latter used generally in fog, and made by A. O. Anderson & Co.

A convenience installed in the pantry is a Stanley & Patterson steward's annuncia-



The "Nourmahal," a striking bow view. This and other photos taken by Edwin Levick while on trip arranged by Mr. Astor especially for the Editor of Motorship

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tor with several stations located in the various rooms. The galley and pantry equipment is very complete, the range being furnished by the New York French Range Co. of New York.

It will be noted from the illustration that the NOURMAHAL is equipped with a single mast from which are flown Mr. Astor's private signal and yacht club flags and from which at yacht regattas the racing committee's flag has often been flown, as Mr. Astor has often generously donated his beautiful yacht to the use of such committee. From this mast is also led the antenna of a ½ k.w. wireless telegraph set installed by the Radio Corporation of America, the wireless-room being located just aft of the pilot-house. In this well-equipped room is also found a most useful item of equipment, a radio direction finder installed by the Marconi Wireless Co. Complete navigational instruments, including a beautiful binnacle housing a Richie liquid compass and hand steering-gear, Cory telegraphs, chart case and table, etc., are found in the pilot-house, while outside on the bridge are docking telegraphs, Kelvin, Bottomley & Baird sounding-machine, weather, cloths, etc.

VINCENT ASTOR
No 23 WEST 26TH STREET

New York, January 11th, 1923.

Editor, "Motorship",
27 Pearl Street,
New York, N. Y.

Dear Sir:

I have read over the article on the "Nourmahal", which you propose to publish in your February issue, and find it entirely in accordance with the facts.

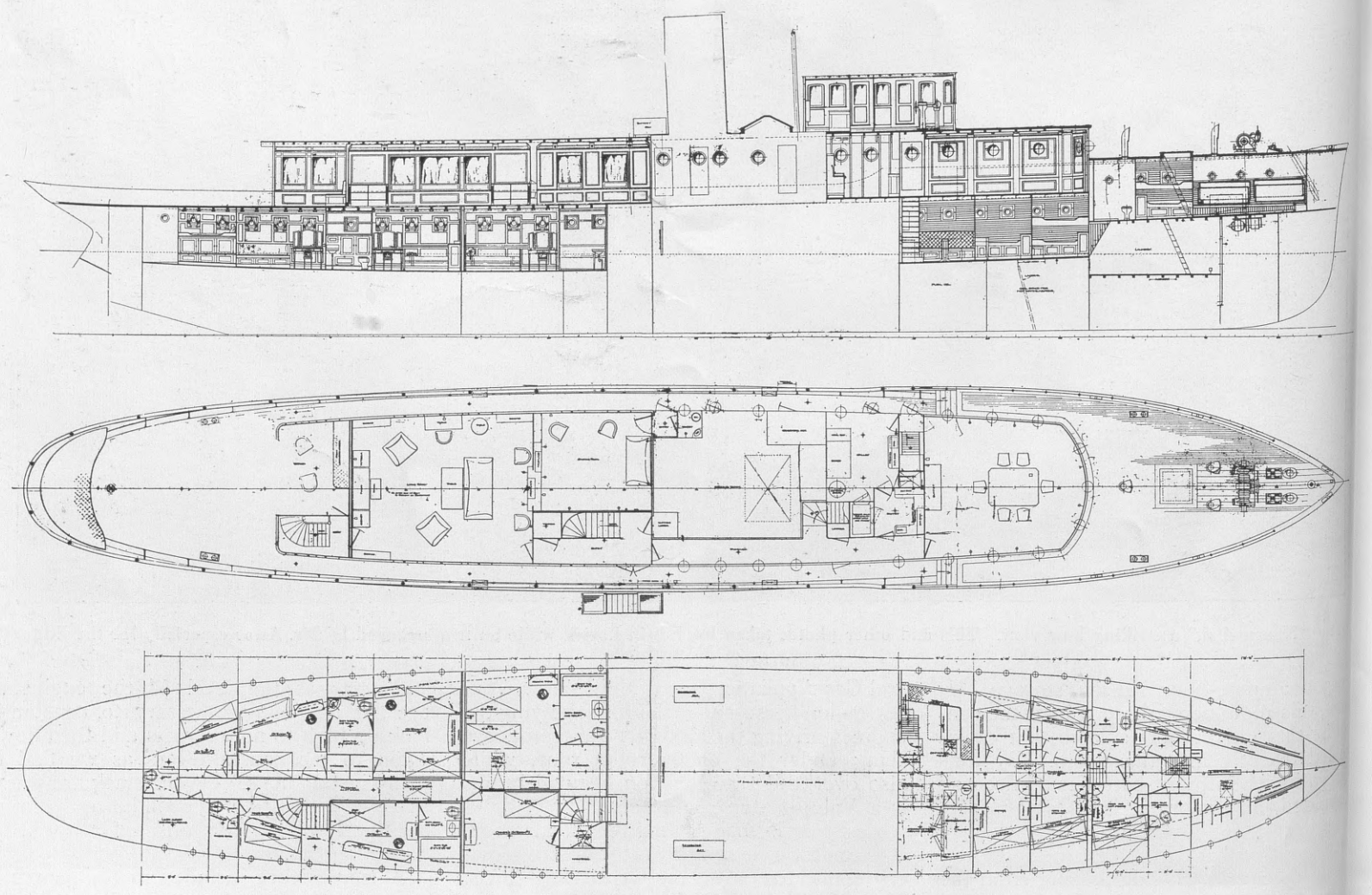
The Yacht has proved most satisfactory in every way and certainly reflects very real credit on her designers and builders. In seagoing qualities, in the consistent reliability of her main and auxiliary power plants, and in general economy, both of operation and upkeep, the "Nourmahal" has entirely fulfilled every expectation.

May I not take this opportunity of congratulating you, not only on the interesting character of "Motorship", but also on the excellent and educational work the magazine is doing in actively advocating a more general use of Diesel type propelling machinery in our merchant marine?

Yours truly,

VA:SW

While on this upper-deck with its spacious sun-deck forward of the pilot-house let us pass aft and inspect the array of small boats. These include on the starboard side a graceful 26 ft. sedan-type owner's launch equipped with a 45 h.p. Scripps four-cylinder, four-cycle gasoline-engine and a life-boat, while on the center-line of the boat is a dinghy. On the port side are two boats, an 18 ft. open runabout for the use of the crew, this launch being equipped with a four-cylinder four-cycle 12 h.p. Kermath gasoline-engine, and another life-boat. Two sets of very strong davits are provided to handle these small boats by means of a Mead-Morrison electric boat-hoist, which has demonstrated its value many times. The days when heavy launches were hoisted on board by means of block and tackle with half the crew pulling on the ropes is past, and we now find electric hoists installed which quickly and with little effort lift the launches from the water and deposit them gently on the deck. Anchors and cable are also quickly handled by a Mead-Morrison electric anchor-windlass on the forward deck and so carefully



M. Y. "Nourmahal"; accommodation plans. Note small machinery space compared to steam-yacht of similar power and length

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M. Y. "Nourmahal," one of the many excellent bathrooms attached to the cabins

M. Y. "Nourmahal" bunkering Diesel fuel-oil at the Standard Oil Co.'s Dock, Bayonne, N. J.

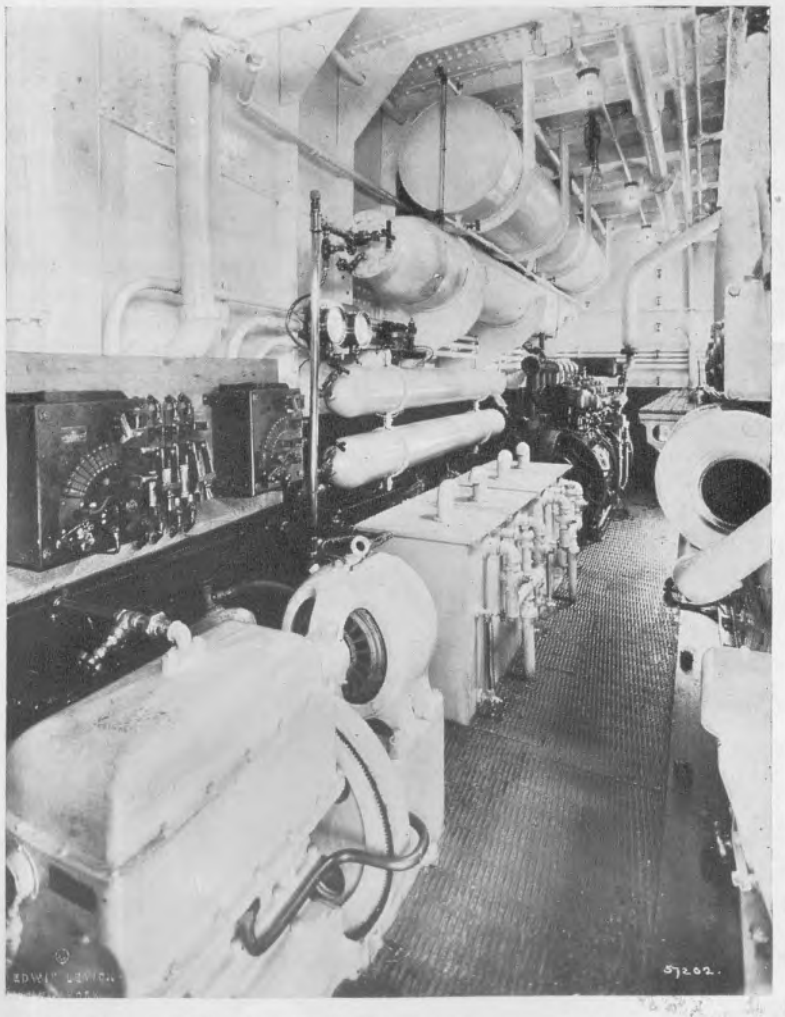
is this constructed that each link of chain accurately fits the wild-cats of the windlass.

Under the forward deck and forward end of the main deck house are quarters for Capt. Klang, Chief-Engineer Drysdale and fifteen other officers and crew, consisting of the following: two mates, 1st and 2nd engineers, two oilers, chief-steward, 2nd steward, two cooks, pantryman, four sailors and, when cruising off-shore, a wireless operator. Both officers and crew have well equipped rooms, dining and pantry accommodations, baths, etc. While passing through their quarters we again find ourselves before the engine-room door.

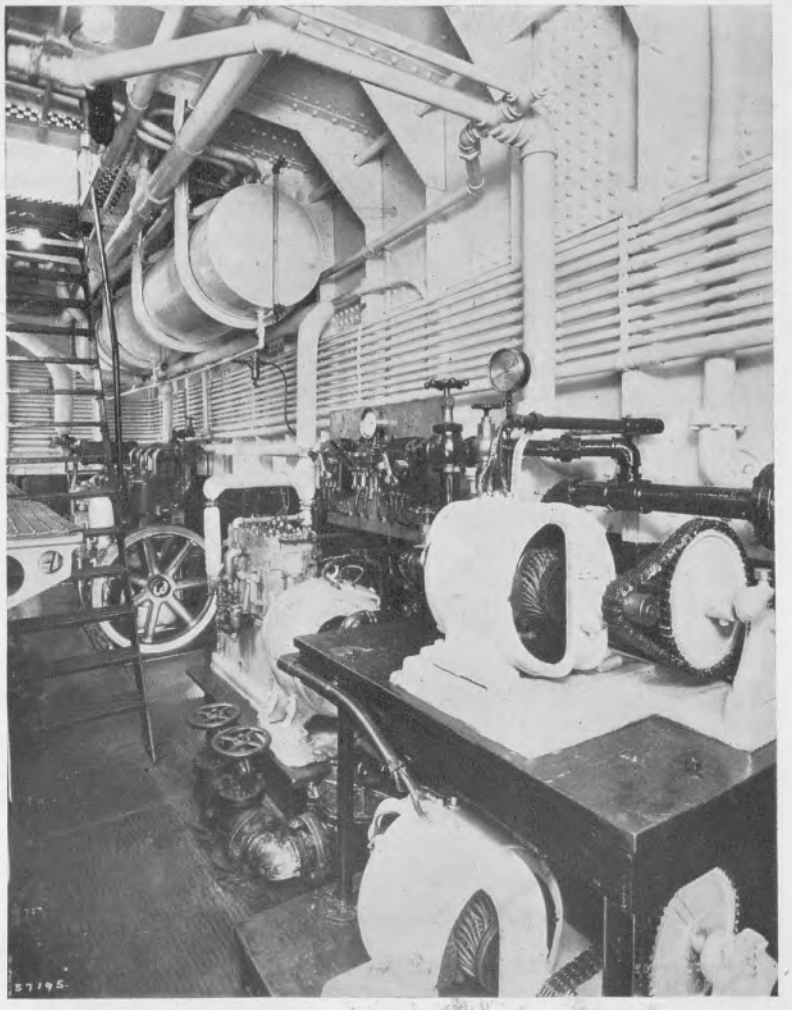
A conversation with Chief Engineer Drysdale revealed many interesting features not mentioned before. For instance, we find that the Nichrome valves originally fitted in the Winton Diesel-engines have never been replaced, the original valves being now in service, experiencing no visible effects of use, such as warping and burning, although operating in very high temperatures usual in Diesel-engines. The service given by these valves, which are made of a special composition by the Driver-Harris Co. of Harrison, N. J., is most satisfactory. There is no doubt that any extra cost is justified by the service given.

This eliminates some of the work in port of the engineer force, as well as the cost of new or spare valves. Likewise we find that these engines are particularly free from piston-ring trouble, the Wasson piston rings having performed very satisfactorily. Vacuum Oil Co. D. T. E. lubricating oil is used for all the engines. The fuel used in the Winton engines is Standard Oil Co. 27 degrees Baumé Diesel-oil, and one of our illustrations shows the NOURMAHAL taking on fuel at the Standard Oil Co. dock in Bayonne, New York harbor, on one of her infrequent trips for fuel.

As we go on deck and note the long steel deck house, we could not go ashore without first inspecting the attractive rooms contained in that house as well as aft of the



M. Y. "Nourmahal." Starboard side of engine-room looking aft, showing auxiliary air-compressor, lubricating-oil filters, 25 K. W. generating set, air-bottles and starting-tanks



M. Y. "Nourmahal," Port side of engine room looking aft, showing pumps in foreground, 7½ K. W. emergency lighting-set, and duplicate 25 K. W. generating-set

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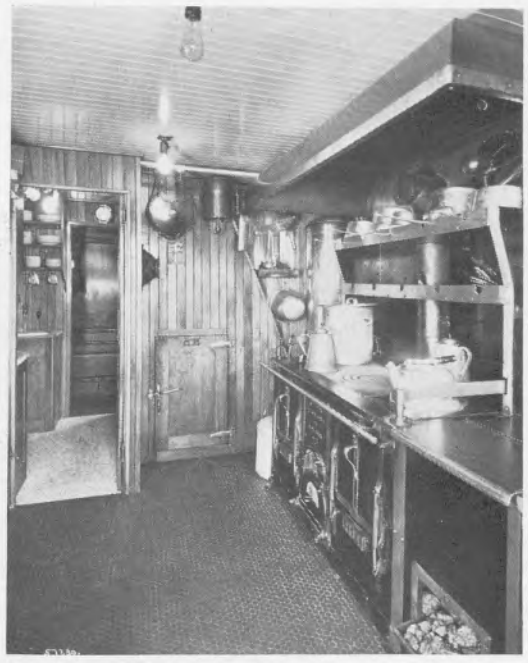
engine-room below deck. And, while our chief interest is in the Diesel-engines and the other mechanical equipment, we believe that our readers will be interested in her owner's and guests' accommodations and in the harmonious decorative scheme. Over the officers' quarters, in the forward end of the main deck house is a tastefully planned dining-saloon decorated in the late Georgian style, the painted paneled walls and ceiling being finished in eggshell white, port-light draperies and hangings of sea-foam green linen figured in gay flowers. In the center of the room stands the dining table of Sheraton design, seating twelve in specially hand-carved chairs, while on each side of the room sideboards of beautifully grained wood grace this most attractive room. A "putty" colored carpet adds just the tone to bring out the harmony of line and color.

One may pass from this room to any of the owner's or guests' rooms without going on deck, a passage being provided the full length of the deck-house, thus affording a convenience much appreciated, especially on off-shore cruises. Through a large observation window in this passage the entire engine-room may be viewed. One of the most comfortable smoking-rooms found on any yacht is on the main deck, the entire room being paneled and ceiled in walnut, one side being provided with an open fireplace of black and fawn marble with antique brass fender and fire-irons. Grouped



M. Y. "Nourmahal," the galley

about the hand-carved walnut table are English club-chairs, while along the wall is a deep sofa, all upholstered in dull green morocco leather. The word "wall" rather than bulkhead seems entirely in place, although speaking of a room on a boat, because one receives the impression of being in a club smoking-room.

Likewise the restful lounge located at the aft end of the deck house on the main deck presents the most skillfully proportioned interior, each and every chair, table and sofa being of just the correct size and finish to convey an impression of harmony and genuine comfort so often lacking in such rooms. Walnut paneling, deep fawn-colored rug woven in one piece and a mantel of black marble form a fit setting for the walnut furniture upholstered in gay hand-blocked linen, sky blue being the dominant note of the linen slip covers, draperies and lamps, while rose, yellow and green are used in the figures on the linen. On the wall at one end of this room which suggests simple, dignified comfort is a Chart of Home Waters, painted by Chas. A. Platt, showing the section of coast between New York and Cape Ann on the Massachusetts shore, on which the NOURMAHAL usually cruises. Near this chart is an Ampico, while book shelves and heavy walnut tables, deep sofa and chairs are placed about the room. A further feature of note is the use of great wide windows, on each side which lower into pockets in the deck house. The NOURMAHAL would be a noteworthy craft if only beauty of line and finish were considered, but when to these are added reliability and economy of operation she becomes doubly so; representative of the best in American yachts.

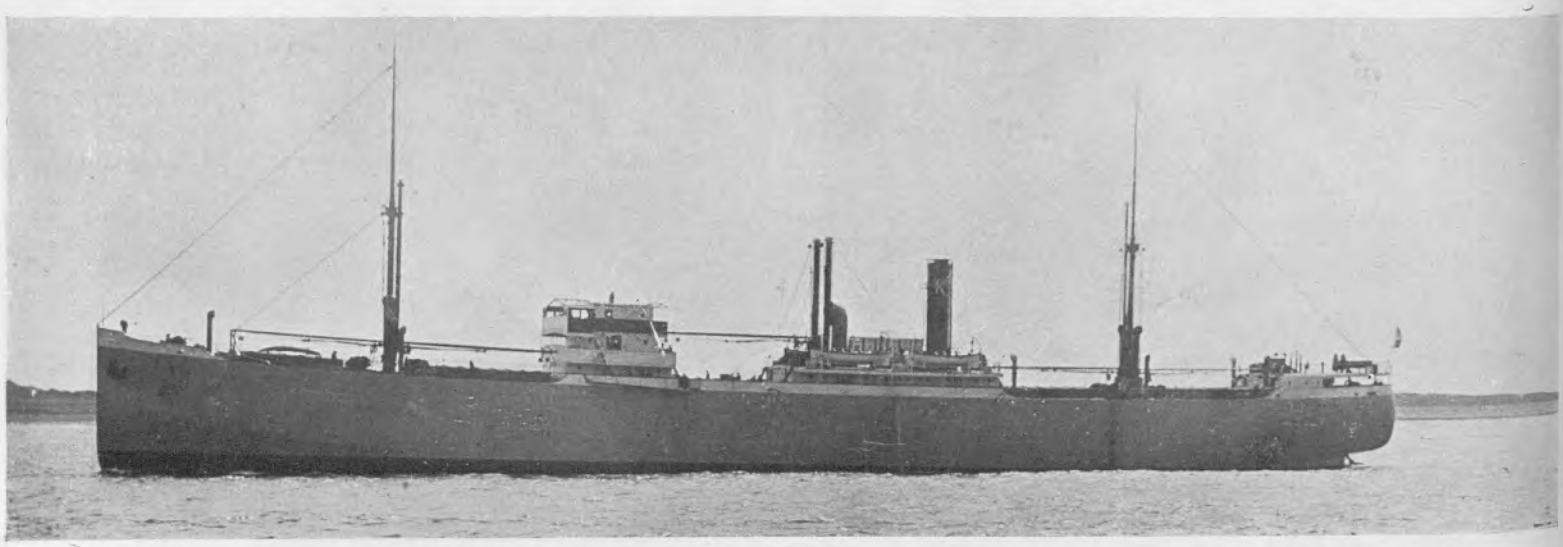
"Hallfried" Here on Maiden Voyage

New Werkspoor-Diesel Engined Vessel Crosses in 15 Days in Winter's Worst Weather—Has a Port to Port Fuel Bill of $2,625.70 Fully Loaded with Oil Bought in Rotterdam—A New Aspect of Ship Operation

BECAUSE so few Werkspoor-Diesel driven motorships visit American ports, their services being mostly from Europe to the Far East, one sometimes loses sight of the fact that there are 23 vessels of 1,000 h.p. and over, as well as 18 smaller craft completed to date with this design of motor, aside from a number of Pacific-Werkspoor and North Eastern-Werkspoor engined ships. In fact, as regards large motorships of the world Werkspoor stands second in point of numbers to Burmeister & Wain and Harland & Wolff.

The HALLFRIED, a new motor-freighter built for the Kleppe Rederi, of Bergen, Norway, but now owned by a committee of Norwegian bankers with Adolf Andersen at the head, arrived in New York recently when all the trans-Atlantic liners were reporting the stormiest weather ever known. She came down from Boston to load 6,700 tons of grain at the New York State canal elevators in Brooklyn, following discharging 6,700 tons of coal at Boston brought from Grangesmouth, England, whence she had sailed at 6:30 p. m. November 11th, arriving at Boston at 6:30 p. m. November 26th. The crossing took exactly 15 days in heavy gales and squalls, according to her log. She sailed from Rotterdam for England to load the coal on October 31st. From New York the HALLFRIED has gone to Greece fully loaded, whence it is expected she will sail for Australia.

Her Chief Engineer is R. Hald, who, it may be remembered, was previously with the Swedish tanker HAMLET, powered with twin Polar two-cycle Diesels. Several years ago Chief Hald contributed to the pages of MOTORSHIP some interesting experiences with the two-cycle engines of this Swedish vessel, when he wrote in terms of praise of their operation. He is equally enthusiastic over the design and performance of the Werkspoor engines.



New Werkspoor Diesel-engined twin-screw motorship "Hallfried"

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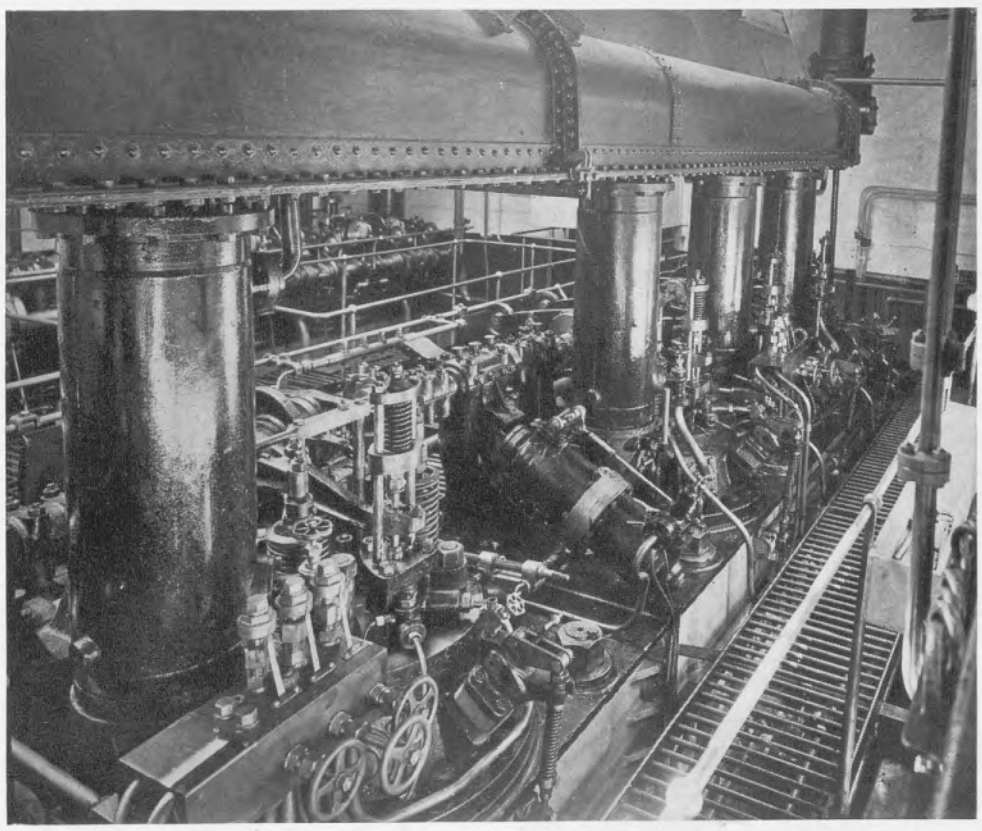


Engine-room of M. S. Hallfried showing cylinder tops, and arrangement of exhaust manifold

and auxiliaries of the HALFRIED, which, he states, are satisfactory in every way. A noteworthy fact is that her main and auxiliary Diesel-engines only used 108½ tons of oil-fuel in crossing the Atlantic. This is according to her log.

Because of heavy weather during the run over, and because the machinery was new and untried, Chief Hald made no attempt to "force" the engines, and, as will be seen from the table on this page, the port and starboard engines averaged 101.8 and 100.8 revolutions, respectively, the vessel averaging just about 10 knots, propeller racing being conspicuous by its absence, despite the high seas running. The rated engine speed is 115 r.p.m, and the ship's designed loaded speed 10½ to 11 knots. Better performance under the conditions encountered could not be desired.

For her size the HALLFRIED has a large cargo capacity, this being 416,429 cubic feet in the holds. To compare her hold capacity with that of a steamer of similar speed, the latter should have a loaded displacement of 10,680 tons, as has the HALLFRIED. In this manner a more accurate comparison can be made, rather than by taking dead-weights and comparing them, the latter being no true guide. Her engine-room is 46 feet long by 50 feet wide, and could be made four feet shorter by adopting Kingsbury or Michell thrust-bearings instead of the old horse-shoe type. Incidentally the lay-out of the engine-room is very well planned, and we will discuss it presently.

There are twelve men in the engine-room, consisting of chief, three assistant engineers, four motormen, three oilers, and one electrician, who also attends to the maintenance of the electric deck winches.

Daily Record of Maiden Voyage of M. S. "Hallfried"

(From 6.30 P. M. Nov. 11th to 6.30 P. M. Nov. 26th)

Date Nov. 1922	Engine Revolutions (Port)	(St'bd)	Distance in Nautical Miles	Fuel Consumption (Main Engines and Auxiliaries) Kilos	(Donkey-Boiler) Kilos
11th	100	100	45	1,324	360
12th	100	99	235	6,440	360
13th	98	97	182.5	6,475	360
14th	101	100	195	6,540	360
15th	98	96	160	6,240	360
16th	100	99	195	6,540	360
17th	101	102	206	6,600	360
18th	105	104	220	6,600	360
19th	101	100	193	6,615	360
20th	105	104	233	6,335	360
21st	105	104	246	6,780	360
22nd	104	103	221	6,630	360
23rd	98	96	172.5	6,630	360
24th	105	104	182.8	6,630	360
25th	101	100	172	6,630	360
26th	107	110	177	5,660	360
			3,035.8 naut. mi.	98,669 kilos (108½ tons)	5,760 kilos (6⅓ tons)

Note—It is not possible to work-out the daily average speed from the above data as we omitted to secure the net hours on each daily run. As the days are not twenty-four hour days, the speed will be greater than the daily mileage indicates.

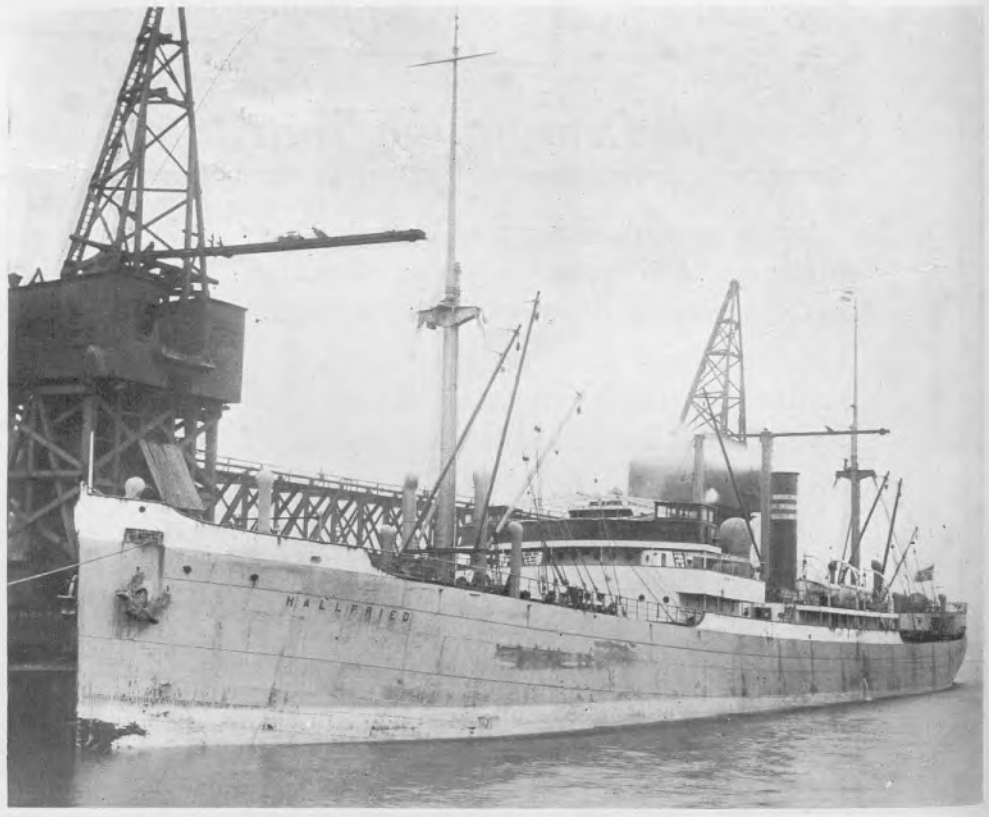
Lubricating-Oil Consumption.

Main bearings, etc. . 598 litres Vacuum D.T.E. heavy
Cylinders (main & auxl. engines) . . . . . 664 litres

Note—Being new engines plenty of lubricating oil was given to the engines. The quantity will be reduced each voyage.

It is interesting to note that when at sea the exhaust-gases from the main Diesels are used in the galley for cooking and hot water, and have proved practical and efficient for this purpose. Werkspoor was the first company to make effective use of exhaust-gases, having adapted the same in 1912 for generating steam in donkey-boilers of large surface area for running the steering-gears of about half a dozen large motor-tankers owned by the Royal Dutch-Shell interests.

On the voyage over, there were 14 complete days and two part days running. For the 14 full days' run the average daily fuel consumption of the two 1,400 i.h.p. main Diesel engines of the HALLFRIED was 6,543 kilograms, or 7.19 tons, including for one auxiliary engine running. The oil-firing of the donkey-boiler for heating the ship took 360 kilos (0.39 ton) in addition per day. The consumption of the main engines alone on the way over figures out at an average of 0.289 pound per i.h.p. hour, and probably would have been slightly lower had they been running at full load. After a year's operation the full-load consumption may reasonably be expected to average between 0.270 and 0.280 pound. No shaft or brake power consumption has been ascertained, the engines never having been run in the shop, but were installed before turning over under load. The fuel used on this maiden voyage was a Persian oil of 0.89 specific gravity (26 to 27 degrees Baumé) supplied by one of the Asiatic



The "Hallfried" unloading 6,500 tons British coal at Boston, Mass.

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Petroleum's subsidiaries in Rotterdam. As only 200 tons were taken aboard, and as no more had been bunkered up to the time of our visit, the extraordinary economy (compared to a steamer) can be appreciated.

Unless all ten electric winches are being used at one time only one Werkspoor four-cylinder 70 K.W. auxiliary set is run when in port, this being sufficient for four winches. There are two of these sets on the port side of the engine-room, as well as a six h.p. Kromhout oil-engine driven auxiliary electric lighting set. In future the latter will be operated on Sundays and at nights instead of one of the 70 k.w. sets. Two of the latter are run in parallel for raising anchors, as a consequence it will be realized that port fuel consumption is remarkably low, averaging not more than one-quarter ton per day, exclusive of fuel used for steam heating. At the time of our visit one of these engines had been running for 500 hours without shutting down.

On the starboard side of the engine-room there is another four-cylinder, four-cycle Werkspoor Diesel of 125 b.h.p. driving a 92 K.W. generator, which in turn provides power for a motor-driven Krupp auxiliary maneuvering-air compressor. The latter, by the way, is much like the standard B. & W. auxiliary compressors.

The HALLFRIED was built at the Rijkee shipyard, Rotterdam, Holland, and equipped with a pair of six-cylinder, four-cycle, single-acting, crosshead-type Diesels constructed by Werkspoor of Amsterdam. Having Norwegian owners she flies the flag of Norway. The main particulars of this ship are as follows, and American owners will find the figures will make significant comparisons with their own steam-driven craft:

Loaded displacement	10,680 tons
Cubic-Capacity of Holds	416,429 sq. ft.
Net Cargo-Capacity on round Trans-atlantic trip (maximum and excluding fuel)	7,000 tons
Power	2,800 i. h. p. (or 2,250 shaft h. p.)
Fuel-Capacity	981 tons
Fresh-Water Capacity	44 tons
Engine-room crew	12 men
Daily Fuel-Consumption inc. auxls	7½ tons
Port fuel-consumption	¼ to ½ ton
Cylinder Bore and Stroke	22.047" by 39.370"
Engine and Propeller speed	115 r. p. m. (10 ft. pitch)
Maiden voyage Average Speed	10 knots loaded
Lubricating-oil consumption (per day)	84 kilos
Length of engine-room	46'0"
Length of main engines	29'3"
Weight of each main engine	120 tons
Length of ship (b. p.)	375'0"
Breadth (m. d.)	51'3"
Depth (m. d. to shelter deck)	34'0"
Draft (mean loaded)	25'3"
Winches	10 electric
Windlasses	2 electric
Make of Engines	Werkspoor, Amsterdam
Acting-Owner	Adolf Andersen, Bergen
Builders	L. Rijkee, Rotterdam
N. Y. Agents	Bennet, Hvoslef & Co., 12 Broadway

We will not deal other than briefly with the extra earning power of this ship due to being able to carry about 750 tons more cargo than an oil-fired (or 1,000 tons more cargo than a coal-burning ship whose owners wish to avoid coaling where coal is dear, or where coal is not available owing to strikes) because we have no knowledge of the rate secured for the 6,700 tons of coal carried to Boston. (The rate on the 6,700 tons of grain loaded at New York for Greece was $4.93 per ton of 2,240 pounds.) Nevertheless the same represents an important sum in dollars, pounds or kroners. It is a fluid amount varying with the quantity of cargo that can be found at a given moment. However, no matter whether bulk or weight cargo she can carry more whenever available, because of her great cubic capacity and because she need only carry 400 tons of fuel and 40 tons of water on an average round trans-Atlantic voyage. Roughly speaking this feature should be worth a minimum of $50,000 a year under average shipping conditions, but with a much greater possible maximum. Incidentally, naval architects should note the weight of the main Diesel engines, namely 120 tons each, including air-compressor and compare it with steam plants.

There is, however, another important phase of her operation to be discussed. The 200 tons of fuel-oil bunkered at Rotterdam cost 56 guilders ($24.40) a ton, and sufficed for the run to New York via Grangesmouth and Boston. Thus the quantity of oil that had to be purchased at the commencement of her maiden voyage was very small, amounting to $4,880, whereas a new steamer starting from Europe on the same trip in winter weather would have had to bunker at least 700 tons of boiler-oil at 45 guilders ($18) per ton. That is to say, she would have a bill of $12,600 compared with the HALLFRIED'S bill of less than half this amount. This definite saving of $7,720 on a one-way trip of two weeks' duration is not to be sneered at. As a matter of actual fact, the HALLFRIED only burned 108½ tons from light to light, so really had a fuel bill of $2,625.70, so showed an economy of nearly $10,000, assuming the steamer would burn about 700 tons at sea and in port.

But this is only one side of the question! Although the HALLFRIED has bunker capacity for 981 tons of oil, she only bunkered 500 tons of Tidewater Diesel oil in New York at $1.89 per barrel ($13.23 per ton), as it was desired to carry the utmost amount of cargo. She has sailed for Piraeus, Greece, whence she may possibly proceed to Australia. However, as no decision has been made regarding her future plans, and as she may go to Rotterdam or other North European ports and thence back to the United States, she only half filled her bunkers, and thus secured the maximum earning power. Had it been decided that she should go to Australia it probably would have been advantageous to fill her bunkers with 981 tons of oil, which would be sufficient to take her to Greece and then to Australia. In fact, she would have a small surplus upon reaching Australia. In such a case her fuel bill from New York to Australia via Greece would be less than $6,615.

Should she actually go to Australia after leaving Greece, it is possible she may be able to secure Persian oil somewhere in the Gulf or at the Suez Canal at a moderate price. She would need only take on sufficient oil to enable her to reach the west coast of the United States via the Pacific Ocean, because when she leaves Greece she will have over 350 tons on hand. Thus, in any event, and regardless of the route taken, the HALLFRIED will be assured of operating at low fuel prices for many months to come. The next time she is on the Atlantic or Pacific Coast of America she can take aboard enough oil for the run to her home port in Norway and for the return to the United States.

It is a simple matter to figure out that such an operating arrangement is not possible with an oil-fired steamer, unless the weight-cargo capacity is infringed upon to a serious extent. Should she be going to the Far East the steamer would be obliged to bunker 750 to 1,000 tons of oil shortly after leaving Greece, and probably would have to pay $20 per ton, if not more; so she would be burdened with a bill of $17,500 to $20,000 more than the motorship HALLFRIED, simply because she could not purchase sufficient cheap fuel in New York. Should she be going to Australia she would be burdened with another bill in that country, as she would again have to take on more fuel. Consequently, is it not a wonder that European shipowners are adopting Diesel power as rapidly as possible, meanwhile quietly laughing up their sleeves at numerous American steamship operators for refusing to build motorships just because the first cost is 10 per cent to 12 per cent higher, on the theory that the saving in fuel bills is not sufficient to offset the interest charges on the higher capitalization.

Another point of operation is that when the HALLFRIED is running on a regular schedule between Norway and America she can load oil to the full 981 tons' capacity of her double bottoms at $11 to $12 per ton, and when in Norway sell 500 tons at $18 to $20 to another ship or to local gas works, but will still have more than enough fuel left to return to the U. S. A. Here is another gain of $9,000 to $10,000 (figuring on to-day's low oil prices) which the steamer cannot make, and is rendered possible because Norway and other Scandinavian countries have no natural oil supplies. American shipowners whose motorships ply to Europe can do the same thing if they have proper business connections in Scandinavia.

We believe that in laying this side of motorship operation before shipowners we are giving them a subject for profound thought. In steamship operation such situations do not arise, because the conditions are quite different. Operators are accustomed to bunkering as much as the steamer will conveniently carry at the start, and in accordance with cargo carried, and then bunkering the balance at foreign ports where long distance voyages are concerned.

To return to the machinery arrangements of the HALLFRIED, we referred to the very neat lay-out of the engine-room. The grating on the upper platform is so constructed that the engineers can walk clear around both engines without changing the level. The main engines have their cast-iron frames on the inboard side, differing from earlier Werkspoor installations. Some of these frames are used for lubricating oil and to contain the inter-coolers for the air-compressors, thus saving valuable space and making less conglomeration in the engine-room. Also the high-pressure injector-air bottles are mounted on each engine between the two sets of three cylinders. This makes a compact job.

Maneuvering of the main engines is controlled by hand-wheels with an interlocking device, making a mistake on the part of the engineer impossible. We were given an opportunity to see the new Werkspoor reversing mechanism in operation, and were most favorably impressed with its simplicity of construction and operation, as were the other visitors aboard. No trouble of any sort has arisen, except that the rings

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of two pistons became somewhat dirty. These were taken out and cleaned in ten hours by the engineers when in New York, this being rendered possible by the special Werkspoor design whereby no cylinder heads, valve gear, piping, etc., is disturbed. We noted that on each main engine there were six Densil force-feed lubricators and one lubricator on each of the auxiliary engines, making 15 all told. The main engines, by the way, can both start on air on either of the three sets of cylinders at 140 to 170 pounds per square inch.

On the starboard side of the engine-room there are the two Diesel-electric generating sets, the auxiliary lighting set, and an emergency steam-driven air-compressing set taken from an old destroyer and installed to comply with Lloyd's rules. It has not been used, and probably never will be! On the port side is the Diesel-driven auxiliary compressor set, a ballast-and-fire pump of the rotary type driven by a 50 b.h.p. motor at 1,300 r.p.m.; also a water-circulating pump (for cooling the engines) operated by a 16 b.h.p. electric motor. On the bulkhead forward of the end of the port engine are the electrically-driven service pumps of the plunger type. Near by on the same bulkhead is the switch and control board. At the after end is the donkey-boiler. In small rooms above on either side of the engine-room are the store and machine shop, respectively. We noticed that very few spare parts were carried, certainly not more than enough to comply with seagoing regulations. For filtering the lubricating oil there is an electric-motor driven De Laval separator, and a three-compartment settling tank made by the engineers of the ship.

More On the Two-Cycle Versus Four-Cycle Controversy

Professor A. S. Watkinson, B. Eng., Contributes an Interesting Treatise on This Much-Discussed Subject Before a British Society

HAVING decided to adopt internal-combustion machinery for his new ship, the British shipowner has next to select the most suitable type of engine for his purpose. He finds that there are in his country five designs of 4-cycle engine manufactured by eight different firms, and six designs of 2-cycle engine manufactured by fourteen firms. These eleven makes of engines, and especially those of the 2-cycle type, differ very widely in design, thus making the choice of an engine extremely difficult.

From the shipowner's point of view, undoubtedly the first and all important consideration is reliability, both in operation at sea on long voyages and in manœuvring. If an engine cannot prove itself to be thoroughly reliable for long periods under the above conditions, the shipowner will have no use for it. After reliability come questions of first cost, weight and space occupied, cost of repairs and maintenance, fuel consumption and lubricating oil consumption, and the ability to burn inferior grades of fuel.

Of the many articles which have appeared from time to time in the technical press, on the advantages and disadvantages of the 4-cycle and 2-cycle engine, practically all have been written by builders of one or other type, and have been more or less in the form of attacks on the other type of engine. In many of these articles, every advantage which can possibly be claimed, however small, is exaggerated and made the most of, and so also is every defect, imaginary or real, which can possibly be found in the other engine, to the bewilderment of the shipowner, who is aghast at the number and apparent seriousness of the defects discovered in both types of engines. An attempt will be made to survey the subject from a more impartial viewpoint, and to assign to each point raised its due importance.

In comparing the two types of engine many elaborate formulæ have been derived whereby the relative weights and sizes may be calculated for engines of a given power. It will, however, be better for the purpose of the present paper, especially as engines of the same power by different makers of each type vary very considerably, to examine the weights and sizes of actual engines from which comparisons can be made.

Particulars of a few engines, representative of both types are given in Table I.

The Doxford engine cannot be included in the above table, as up to the present time it has only been built in one size, namely, 3,000 I.H.P. Although its scavenge pump is direct driven from the engine crankshaft, this engine shows a very considerable saving in space over the 4-cycle engine, owing to its opposed piston construction. The Doxford 3,000 I.H.P. engine running at 77 R.P.M. is 42 feet 7½ inches long, whereas the 8-cylinder 3,200 I.H.P. Burmeister and Wain 4-cycle engine is 56 feet long, although this engine runs at 125 R.P.M. while the 3,300 i.h.p. Cammellaird-Fullagar engine running at 77 R.P.M. is only 33 feet long. (We think interest would have been added if the author had included some American engines.—Editor.)

> IT is the opinion of MOTORSHIP that the controversy between the two-cycle and four-cycle advocates has become embittered, without real cause, to the detriment of the entire Diesel-engine industry, and that it is a subject which should be discussed only in a dispassionate and impartial way, because both these types have their definite place in the industry as well as possessing their individual merits. Our views on the matter and comments on this particular paper are given on the editorial page in this number.

As the Burmeister and Wain engine is the most widely used of the 4-cycle engines a comparison will be made between it and the Sulzer and the Cammellaird-Fullagar engines, taking the motorship PERU as a basis for the calculations.

The twin-screw motorship PERU is propelled by Burmeister and Wain engines each identical with that in Table I.

The main dimensions of this vessel are as follows:

Length over all	442 ft.
Length B. P.	425 ft. 5½ ins.
Beam moulded	55 ft. 0 ins.
Depth to shelter deck	38 ft. 6 ins.
Draught loaded	28 ft. 0 ins.
Displacement	13,400 tons.
D. W. T. capacity	9,400 tons.
Gross tonnage	6,919
Net tonnage	5,223
Speed loaded	11.15 knots.
Engines	2×1,250 S. H. P. at 125 R. P. M.

The auxiliaries are electrically driven, current being supplied by three Diesel engine-driven dynamo sets of 60 k.w., each running at 300 r.p.m.

The other auxiliary machinery need not be considered, as it will be approximately the same in all three cases.

A comparison of the weight of the main engines and generating sets of the above ship with the weights of Sulzer or Cammellaird-Fullagar engines which were installed is given in Table II.

(*Continued on page* 113)

TABLE I.—PARTICULARS OF ENGINES OF 1,250 SHAFT H. P.

ENGINE	2-Cy. or 4-Cy.	B.H.P.	No. of Cyl.	Bore (Ins.)	Stroke (Ins.)	R. P. M.	B. M. E. P. (lbs. sq. in.)	Piston-speed (ft. min.)	Weight (tons)	Overall length (ft. ins.
Burmeister & Wain	4	1,250	6	24.8	37.8	125	72	785	192	37 6
Vickers (airless-inj.)	4	1,250	6	24.5	39	118	76	765	...	36 6
Werkspoor	4	1,250	6	23	41	125	77	855	137	32 0
Sulzer	2	1,250	4	23.6	37	102	76.3	648	168	31 6
Sulzer (turbo. scav. pumps)	2	1,250	4	...	...	125	...	...	115	....
Ansaldo-San Giorgio	2	1,250	4	24.8	35.4	110	66	678	...	30 0
Cammellaird-Fullagar	2	1,250	4	18.5	26	125	71	540	112	21 6

TABLE II.

Comparison of Weights of Machinery, and the advantages gained by the adoption of 2-Cycle engines

ENGINES.	Burmeister and Wain.	Sulzer (turbo scav.)	Cammellaird Fullagar.
S. H. P.	2,500	2,500	2,500
Weight of two main engines, tons	384	230	224
Weight of two Intermediate Shafts, tons	39.2	33	35
Weight of Diesel Dynamo Sets, tons	33	60	29
Total weight, tons	456.2	323	288
Increase in D. W. T. capacity of ship, tons	....	133.2	168.2
Increase in D. W. T. capacity per cent	....	1.42	1.7
Fuel Consumption, lbs. per B. H. P. per hour	.40	.406	.4
Fuel Consumption, tons per 24 hours	10.7	10.87	10.7
Increase in Fuel Consumption, per cent	....	1.6	Nil.

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In connection with the above figures it should be noted that the Burmeister and Wain and the Cammellaird-Fullagar engines are of very substantial construction and are low rated, while the Sulzer engine is evidently of lighter construction, and is more highly rated. A comparison on the basis of equal deadweight tonnage can be made by slightly altering the dimensions of the ship, to suit the particular type of propelling machinery proposed.

In a ship of this size and speed the tonnage dues over a year's working may amount to from 0.6 to 0.86 of the total fuel cost for the year, depending on the ports of call and the price of oil the net result for the figures regarding the reduction in tonnage dues may be equivalent to a saving in fuel consumption of about 1 per cent. The reduction in steel weight represents about £20 per ton of steel weight of ship saved, at present-day prices of materials, and labor, this amounting to a reduction of £1,000 in the cost of the ship in the case of the first alternative with the Cammellaird-Fullagar engines.

A still greater advantage can be gained by the installation of 2-cycle engines running at a reduced speed, say, 90 r.p.m., instead of 125 r.p.m., as with Burmeister and Wain engines, on account of the higher propeller efficiency attained at the lower speed. If the ship required 2,500 s.h.p. to give her 11 knots at 125 r.p.m., then at 90 r.p.m. only about 2,350 s.h.p. will be required, a reduction of 6 per cent.

The machinery weights will now be as in Table III.

engine-room below this figure on account of the existing regulations governing the calculation of the net tonnage on which the dock and harbor dues are based.

In the matter of space occupied in this type of ship there is no advantage to be obtained by the substitution of 2-cycle for 4-cycle engines so long as the present tonnage regulations are in force. According to these regulations, the deduction from the gross tonnage allowed for the engine-room when calculating the net tonnage is 32 per cent. of the gross tonnage, where the engine-room actually measures between 13 per cent. and 20 per cent. of the gross tonnage. Above and below these limits the deduction is only 1.75 times the tonnage of the engine-room. If the lower limit, 13 per cent., were altered to about 8 per cent. in the case of the motorship, then the 2-cycle engine could show big savings when compared with the 4-cycle engine.

(It is obvious that the arrival of the motorship has made these old British Board of Trade regulations out of date and inadequate to meet modern conditions. The Shipping Board should negotiate with the B. O. T. with a view to having the rules modernized.—Editor.)

In the motorship PERU, for instance, if the tonnage regulations were altered the Burmeister and Wain engine-room might be reduced to about 12.0 per cent. of the gross tonnage, whereas with Cammellaird-Fullagar engines this figure could be reduced to 8.8 per cent.

A study of the engine-room plans shows that if the tonnage regulations were altered

TABLE III.
Advantages of 2-Cycle Engines with reduced R. P. M.

ENGINES.	Burmeister and Wain.	Sulzer.	Cammellaird-Fullagar.
Total S. H. P.	2,500	2,350	2,350
R. P. M.	125	90	90
Weight of two main engines, tons	384	315	288
Weight of two Intermediate Shafts, tons	39.2	37.4	41.3
Weight of Diesel Generating Sets, tons	33	60	29
Total weight, tons	456.2	412.4	358.3
Increase in D. W. T. capacity, tons	....	43.8	97.9
Increase in D. W. T. capacity, per cent	....	.47	1.0
Fuel Consumption, (lbs. B. H. P. hour)	.40	.406	.40
Fuel, tons—(24 hours)	10.7	10.20	10.06
Reduction in Fuel Consumption, per cent	....	4.67	6.0

The present Burmeister and Wain engines running at 125 r.p.m. could be replaced by larger Burmeister & Wain engines running at 90 r.p.m., but there would be an increase in machinery weight of from 120 to 150 tons, involving an increase in the size of the ship and the power required to attain the same speed, the deadweight carrying-capacity of the ship remaining the same.

The Cammellaird-Fullagar engines, on the other hand, give to the ship an increased deadweight carrying capacity of about 100 tons, and at the same time the fuel consumption is reduced by 6 per cent., due to the smaller power required. As an alternative to increasing the deadweight tonnage of the vessel, advantage can be taken of the reduction in machinery weight of 100 tons by slightly altering the design of the ship, in which case the s.h.p. and the fuel consumption would be still further reduced.

The existing engine-room of the motorship PERU is equivalent to about 13 per cent. of the gross tonnage of the vessel, and is, therefore, at the lower limit as regards size. Shipowners are unwilling to accept an

and the forward bulkhead below the lower deck was removed aft one frame space, the bulkhead of the after end of the galley carried down to the lower deck, and if Michell thrusts were adopted, the thrust recess might be shortened by a frame space. The auxiliaries would have to be rearranged, one of the dynamo sets being moved over to the starboard side and the switchboard and transformer flat would be carried into the wings of the engine-room port and starboard. This would then represent the minimum size of engine-room possible with these 4-stroke cycle engines without unduly cramping the auxiliaries.

In the same engine-room rearranged and reduced in size to suit Camellaird-Fullagar engines, the length of the main part of the engine-room would be reduced by 7 frame spaces below the lower deck and 11 frame spaces above the lower deck, and the thrust recess could be shortened by 1 frame space as for the Burmeister & Wain engine room. This engine-room, if the thrust recess were reduced, would represent 8.8 per cent. of the gross tonnage. The cubic cargo capacity would be increased by 22,300 cubic feet, or about 4 per cent.

In a ship of this type, therefore, the greatest advantages which the shortest existing 2-cycle engines can show over the present 4-cycle engines, disregarding the present tonnage regulations, is as follows:

Increase in deadweight tonnage capacity . . . . . 98 tons
Reduction in fuel consumption 6%
Increase in cubic cargo capacity . . . 4%

The relation between cubic cargo capacity and deadweight tonnage capacity is, with this reduced engine-room, 61 cubic feet per ton deadweight, as against 58½ with the Burmeister and Wain engines. With the regulations now in force the saving of 4 per cent. on the cubic cargo capacity cannot be realized.

TRIALS OF THE SINGLE-SCREW MOTORSHIP "EKNAREN"

DOXFORD'S third single-screw motorship, the EKNAREN, recently ran very successful trials off the river Tyne, and was taken over by her owners, the Transatlantic Steamship Company of Göteborg. The owners were represented by Mr. Tadge Madsen. The EKNAREN is a sister to the Transatlantic Company's motorship, YNGAREN, details of the maiden voyage of which were recently given in MOTORSHIP.

Mr. Madsen stated that while the price of the vessel was high, he considered they got a vessel well worth the money and that this view was based on his six months' trip on the sister motorship YNGAREN. He considered people should know what is being done at Doxford's Sunderland plant, as they have engineers with more experience with internal-combustion engines than anywhere else in the world, and that he hoped Doxford's would soon have their six empty berths filled with Diesel-engined ships.

Mr. Robert Traill of the Fairfield Shipbuilding Company, which concern recently received the contract to build a 12,000-13,000 h.p. 20,000 tons 18-knot motor-liner for the Union Steamship Company of New Zealand, was present at the trials. He stated that doubtless those on board would agree that no steam-engines put to sea had maneuvred with greater ease than the Doxford Diesel-engines of the EKNAREN. The ship was very light and the propeller half out of the water, but when the boat pitched there was no racing whatever, the governor acting instantly. Those on the trial could go home recognizing the fact that shipowners must adopt Diesel engines.

Mr. Traill then referred to the 600-foot motor-liner which they have just commenced to build. The result of Diesel power has been to increase the passenger capacity by 18 per cent with a corresponding increase in the cargo space.

This remarkable motor-vessel would make an 18-day trip at 18 knots' speed from Australia to Vancouver, B. C., and the gains were so great that the slight extra cost was negligible. Continuing, Mr. Traill said that the Diesel-engine was necessarily more expensive than the steam-engine, and it is foolish for the ship-owner to wait with the idea of getting Diesel-engines in ships at the price of steam-engines, as they will eventually be forced to use Diesel-ships.

OIL ENGINE POWER

The initial number of our new magazine, OIL ENGINE POWER, now on the press, will be ready for distribution within a few days. Owing to unforeseen circumstances beyond our control this has been delayed.

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MOTORSHIP

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NEED FOR LESS DESTRUCTIVE COMPARISONS

SURELY oil-engine builders have enough to do defending their products against such subtle depreciation as made by James Scott, and published elsewhere in this number, instead of wasting valuable energy and time jumping on each other. Without waiting until shipowners in general are won over to oil-engine power several of the numerous Diesel builders are constantly pulling each other's designs virtually to pieces with the object of convincing prospective purchasers that their own particular type is the best. Actually this has the opposite effect to that intended, and bewilders and even scares the vessel-owner completely away from internal-combustion drive, with the result of the steam-engine and boiler makers taking advantage of the disturbance by slipping in and securing the order. "Knocking" the other fellow's product is carried further than among the different sales-engineers and is introduced right into the meetings of engineering and shipbuilding societies by executive officials. Recently MOTORSHIP has refrained from publishing papers calculated to react unfavorably upon the industry as a whole, or has omitted sections of such treatises. Particularly bitter is the "war" between the two and four cycle types, which has been carried on intermittently for over ten years.

It is time that everybody competing in this market realized that the strongest competitor of the four-cycle Diesel engine is not the two-cycle type but steam machinery, and that the most active rival of the two-cycle engine is also the steam plant, and that better team-work would produce more business for both. This, of course, does not mean that each individual manufacturer should not claim his honest belief that his engine is the best. If this was not his conviction he would abandon its construction for another design, so it is proper business practice for his sales-engineers to outline the merits of the individual features of his design and to indicate in what manner he considers his own product superior to those of his competitors. This is vastly different to dissecting structural features of other makes of engines and condemning them. Also, comparisons of lengths, weights, speeds, mechanical efficiency, piston-speeds, indicated pressures and service records are legitimate methods of securing orders and should form the principal talking points of sales-engineers when discussing other makes. There is room as well as a distinct market for both two and four-cycle engines, and for more than one make of both designs, and regardless of detraction the shipping industry will continue to support quite a variety of designs. Destructive criticism will only react unfavorably on the Diesel business as a whole, to the detriment of the critic as well as the others.

Elsewhere in this issue we give extracts from a paper recently read in Great Britain by A. S. Watkinson, B.Eng., on the subject of two-cycle versus four-cycle oil-engines, but apparently the author is not directly connected with any Diesel-engine builder, so has endeavored to give an unbiased comparison of the leading designs from a shipowner's aspect and not from one of competitive criticism. The first section of his treatise is well taken, as he has secured the dimensions, weights, etc., of some of the leading makes and given comparative tables. However, the second half of his paper, which we have not published, is devoted to mechanical and structural considerations, in which Mr. Watkinson leaves the definite and wanders into the controversial, and has fallen into the common error of mis-stating conditions through introducing what is probably his personal understanding rather than actual facts; consequently he has trodden very dangerous ground and thus has jeopardized the value of his article. In doing so he has accomplished the very thing he honestly started out to avoid. For instance, when speaking of four-cycle engines he makes the following statement:

"In the four-cycle engine, the exhaust valves are a continual source of trouble. These valves are usually built with a separate removable seat of special material. Even under the best conditions, when using good Diesel engine oil, the suction and exhaust valves require grinding in frequently. When using heavier grades of fuel, and especially boiler-fuel oils containing a large percentage of sulphur, the exhaust valves are rapidly corroded under the removable seats, and the latter break away in consequence. The seats themselves also become deeply pitted. Cases are known in which a complete set of new exhaust valves is required at the end of every voyage."

Those who have followed the operation of dozens of larger motorships know that the above is not the case, also that sulphur up to three or four per cent. has practically no detrimental effect on exhaust valves unless there is water in the oil, also that generally an engine will run for eighty to ninety days without changing valves, and the grinding-in is done at sea on a duplicate set. However, it is more pleasing to note that Mr. Watkinson concludes his paper by saying that a *"careful consideration of the points which have been discussed leads to the conclusion that the mechanical and structural advantage and disadvantages of the four-cycle and the two-cycle engines are at present fairly evenly balanced between the two types. There is no reason, therefore, why the two-cycle engine should be less reliable than the four-cycle engine, which is confirmed by a study of the records of voyages of modern two-cycle engined ships."*

ANOTHER VALUE OF CRUISING RADIUS

DURING stormy winter weather, one frequently hears of a steamer sending out an S. O. S. for assistance owing to having run out of oil or coal fuel, such as the recent case of the geared-turbine steamer LIBERTY, but never a motorship which storms may also have delayed. This is because 20 tons of oil will take an 8,000 tons, 11-knot Diesel-driven vessel 480 to 525 miles, but will only drive a similar steamship 160 to 175 miles at the most in bad weather. Whenever a ship runs out of fuel in a storm the owner stands the risk of losing her, paying salvage, or having towing charges. In any event it is a big expense, aside from the value of the time lost by the ship and her crew. Nevertheless, how many shipowners take this item (which means a saving of real money), and place it to the credit balance of Diesel power when figuring-out and comparing the constructional costs of steamers and motorships. We draw the attention of the Cosmopolitan Shipping Company of New York who are operating the S.S. LIBERTY, and of her owners, the U. S. Shipping Board to this paragraph.

COST OF PROPELLING MACHINERY

ACCORDING to Andrew Hamilton, a British shipbuilder, "the price today in Great Britain of a triple-expansion engine of 3,000 h.p. is £33,000, and the price of a reduction-gear turbine set of similar power is £43,000. A single-acting Diesel engine costs £67,000, and a Cammellaird-Fullagar opposed-piston engine about £60,000." If we take the average British Diesel price as £63,000 ($289,800), it means that its cost is much about that of American Diesel engines today. In actual fact the cost is higher when we consider the greater purchasing power of British money in Great Britain. Yet a large number of motorships are building today in Great Britain, which would indicate that the American theory of "Diesels being too expensive" is somewhat overrated.

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Interesting Notes and News from Everywhere

License to construct Krupp Diesel-engines has been secured by Erhardt & Sehmer, Saarbrucken, Germany.

A lecture on Diesel-electric drive was given before the Ocean Association of Marine Engineers, New York, by H. Wild of the marine engineering department of the General Electric Co.

The Munson Line now owns or operates five motorships, namely the ORMIDALE, GLENDARAEL, FRITZOE, MUNMOTOR and the second Lake type steamer now being converted at the Sun Shipyard.

An order for two 5,400 tons Diesel-driven freighter-passenger vessels has been placed with Fried Krupps of Kiel-Gaarden, by the Flensburg Steamship Co. They will be sister-vessels.

The contract price of the 7,000 tons Diesel-driven motorship recently ordered from Burmeister & Wain by the Rederi Norden A. B. of Norrkoping, is reported as being Kr. 1,500,000.

The Holden Evans Steamship Co., owners of the Bolinder-engined tanker HOLDEN EVANS, is a subsidiary of H. L. Doherty & Co. of New York City. She is a twin-screw boat with a 1,000 h.p. engine.

An order for a Beardmore-Tosi Diesel-engined motorship of 11,000 tons deadweight has been received by the Blythswood Shipbuilding Co., Ltd., from British shipowners.

An order for a Diesel-driven 600 tons oil-barge has been placed by the Union Oil Co. of Cal., with the Los Angeles Shipbuilding & Dry Dock Co., the contract price being about $45,000.

The Lake-type steamer FRANK J. LYNCH will be converted to Pacific-Werkspoor Diesel power by the Union Construction Co. of Oakland, Cal., whose bid of $65,794 and forty-two days delivery secured the contract.

It is reported that new Diesel-engines are to be installed in the wooden ship OREGON now at the Marine Construction Co. yard, Seattle, Wash., where she was recently dry docked for repairs, painting and drawing of tailshaft.

The Kosmos Line motorship OSIRIS passed through the Panama Canal on Nov. 21 on her maiden-voyage laden with 4,420 tons of merchandise, consisting chiefly of iron and steel for West coast ports in South America.

Reference is drawn to a letter from Fred V. Burns, on our "Readers' Opinion Page" in this issue, in which they state they will be in the market for two motor cargo ships capable of loading 4,000 tons zinc concentrate, within the next two months.

A single-screw motor-tanker of 5,000 tons has been ordered from the Götaverken of Göteborg, Sweden, by Nobel Bros., in which a 2,000 i.h.p. 6-clinder two-cycle type Nobel Diesel engine described in our issue of December, 1921, will be installed.

By the addition of the motorships LIMA and VALPARAISO to their fleet the Johnson Line now has monthly sailings from Pacific Coast to Scandinavian ports. The other motorships operating in this service are the BALBOA, BUENOS AIRES, and SAN FRANCISCO.

Recently the Dutch motorship DINTELDYK left American ports loaded with 12,000 tons of cargo, making a speed of over 12 knots burning 17 tons of oil per day. Any shipowner desiring to check these figures should call up W. Van Doorn, managing-director in New York of the Holland-American Line, her owners.

Through a typographical error on page 56 of our January issue it was stated that the two single-screw motorships for the United States Steel Products Co. under construction at the Federal Shipbuilding Co. yard were each having a 250 h.p. McIntosh & Seymour engine. This, of course, should read 750 shaft h.p. per ship.

During the financial year 1921-22 the Götaverken, Göteborg, Sweden, ship and Diesel engine builders, made a net profit of 1,351,000 kroners. After writing off 373,000 Kr. for depreciation, a dividend of 8 per cent was paid. This Swedish concern has been a consistent advertiser in MOTORSHIP since 1919.

Hugo Stinnes, the German shipping magnate, is inaugurating a new service between Antwerp, Rotterdam and the far east by placing in operation the 8,800 tons d.w. motorship EMILE KIRDORF recently completed. Three other motorships are building for this service of Stinnes, namely, the CARL LEGIEN, ADOLF VON BAYER and ALBERT VOGLER.

BORGAA is the name of a new 7,500 tons motorship launched at the Akers Shipyard early in December last for Fred Olsen of Kristiania, Norway. Twin Akers-B. & W. Diesel engines of 1,400 i.h.p. each, as well as three 80 i.h.p. auxiliary Diesel engines will be installed. Length of ship, 377′, breadth 51′3″, depth 34′. All auxiliaries will be electrically operated.

LOCHGOIL, one of the Royal Mail Steam Packet Co.'s new 9,500 tons gross cargo motorships, ran successful trials on Dec. 14th on the Clyde. She was built by Harland & Wolff, Govan, and is propelled by twin eight-cylinder 3,200 i.h.p. H. & W.-B. & W. Diesel engines turning at 115 r.p.m. Speed, 12½ knots, length 502′, breadth 62′, depth 38′6″.

The 12,000 tons d.w. motor-liner ordered from Blohm & Voss by the Hamburg-South American Line will have accommodation for 490 cabin passengers, and third-class accommodation for 2,000 passengers. Her Blohm & Voss Diesel-engines will propel her at 13¼ knots when she is completed at the end of 1923. Her length is 495 ft., with 64 ft. breadth.

Plans of the newly formed Motor Ship Service Corporation of San Francisco, Cal., include the purchase of twelve 8,800 tons steamers from the Shipping Board and converting them to Diesel power. Changes will be made to the hull and equipment to make them refrigerator ships; a speed of 13½ knots is desired. Proposals are being asked from Diesel-engine builders.

According to the official statistics of the Swedish Board of Trade the Swedish Mercantile Marine was increased during November by 11 ships of together 2,499 gross tons. At the end of the month the Swedish Mercantile Marine consisted of 1,249 steamers of 924,000 gross tons, 789 motor vessels of 208,000 gross tons and 912 sailing ships of 110,000 gross tons, or together 2,950 ships of 1,242,000 gross tons.

The first German-built vessel to enter San Francisco harbor since before the war arrived at that port during December, this being the motorship PRINCIPIO. She is commanded by Capt. T. J. Keeney, an American, the two mates are American while the balance of the crew are Germans and Mexicans. Her arrival inaugurated the service of the United Fruit Distributers, Inc., which has been formed to transport fruit between San Francisco, Los Angeles and ports on the West coast of Mexico.

During 1922 the North Eastern Marine Engineering Co., Ltd., of Wallsend-on-Tyne, constructed 18 triple-expansion marine engines and two geared-turbine sets and one Diesel engine of 1,400 h.p. for merchant ships, the total h.p. being 43,835 i.h.p.

The Diesel engine referred to was installed in the Norwegian motorship SEGOVIA. During the last five years the average construction of marine engines has been 75,142 i.h.p. per annum.

According to a communication from the Deutsche Werft, this company has received orders for fifteen additional motorships aggregating approximately 131,000 tons d.w. and 47,200 h.p. All these vessels will be equipped with A.E.G. Burmeister & Wain type four-cycle Diesel engines. The motorships delivered from this yard during 1922 are the JULIUS SCHINDLER, OSSAG, ISIS, OSIRIS, and TIRADENTES. Now nearing completion are the motor freighters SPREEWALD and TITANIA.

The Canadian Pacific Steamship Co. has ordered two 600 shaft h.p. McIntosh & Seymour four-cycle Diesel-engines for installation in the automobile ferry to be built at Yarrow's Esquimalt Shipyard for service between Bellingham, Wash., and Victoria, B. C. The vessel will be of wood construction, and is due to be completed about April next. She will be 170 ft. long, 43 ft. breadth and 11 ft. deep. Two round trips per day will be her schedule. Thus this great trans-continental railroad is adding yet another link to its already comprehensive system of transportation.

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How Opposition Interests Mislead Shipowners

Extract from and Comments on Treatise by James Scott, M.I.E.E., Which Show How Figures for Motorship Operation Are Made Basically Wrong

WERE it not for the existence of this magazine which closely watches the interests of the motorship and oil-engine industries it is probable that by this time the Diesel engine in this country would be a dead letter, so great has the pressure been to decry this economical power. Misleading and derogatory papers are constantly being read before engineering societies as well as inaccurate articles published in the marine press. Treatises of this nature are not confined to this country but occasionally appear in Great Britain, and which, of course, have a certain influence here. A recent case in point is that of the paper on Electric versus Geared Propulsion read before the Society of Consulting Marine Engineers and Ship Surveyors at Liverpool, England, by James Scott, M.I.E.E. We reproduce on this page a comparison table extracted from Mr. Scott's paper, which we consider exceedingly misleading.

In referring to the table Mr. Scott says:

"I have prepared comparative cost sheets, Table A and A2, showing the running costs per annum for fuel oil and lubricating oil for turbo-electric drive. Table B shows a saving of 3 per cent. by taking the auxiliary supplies and lighting from the main generators when once the ship has left port. Table C and C1 shows the running costs for fuel and lubricating oil for geared turbine. Table D shows the running costs for fuel oil and lubricating oil plus the fuel oil for running auxiliaries for Diesel-drive.

"It will be seen on actual running costs for fuel, Diesel works out at £34,087 per annum, geared turbines £42,034 per annum, and turbo-electric at £45,846 per annum.

"While it is well known that on actual fuel consumption the Diesel ship works out considerably cheaper than any other form of drive, I am of opinion that the wear and tear and extra weight will considerably outbalance the benefit gain on fuel.

"Referring to Table E, comparison is given between the Diesel ship and the turbo electric, both as regards costs and weights, and I have credited the turbo electric ship with an extra capacity of 1,000 tons for cargo, and have taken a fair average price of 15s per ton.

"The difference between the geared turbine and turbo electric in running costs is due to the efficiency of 90 per cent. for a geared turbine, and 80 per cent. for the turbo-electric."

In the first place it seems somewhat extraordinary that Mr. Scott should state that the turbo-electric ship will carry 1,000 tons more cargo than a three Diesel-driven vessel and to the loss of the customers of the builders of the Diesel engines. Also, seeing that Diesel power consumes less than one-third of the fuel burned by turbo-electric drive it means that the steamer must carry several thousand tons more oil than the motorship on a trans-oceanic voyage.

Therefore will Mr. Scott kindly explain why no allowance is made for this in the cargo and passenger capacity of his motorship which means increased earnings! Furthermore, why not include Diesel-electric drive in the comparison tables? And, why the unfair, vague, and unsubstantiated claim that the wear-and-tear and extra weight of Diesel engines will considerably outbalance the benefit gained on fuel? We trust that marine Diesel-engine builders will not allow such grossly inaccurate statements to go unanswered. Meanwhile we will refer Mr. Scott to the figures on a 12,000 h.p. vessel given on page 918 of our December, 1922, issue.

As his paper has only just been read, we presume that Mr. Scott has incorporated up-to-date fuel prices in his comparison table. Also that the prices given are costs at British ports. It will be noted he quotes boiler-oil for the turbo-electric ship at 60s (about $13.80) per ton and Diesel-oil at 82s6d (about $19) per ton, not even giving the motorship the possible benefit of using boiler-oil as fuel, British standard fuel of this class usually being about 18 degrees Baumé, compared with 14 to 16 degrees in the U. S. A. However, for the purpose of our comments we will assume that the motorship will use Diesel oil.

Now, no matter the cost of the two fuels in English ports, their prices at New York have been about $10 and $11.55 per ton, respectively, for nearly six months, or only a difference of $1.50 a ton between them compared with apparently over $5 in Great Britain. Because of the low fuel-consumption of Diesel power the motorship would only require to purchase her first one-way bunker in England, as when she reached America, or the Far East, she could bunker for round voyages at low prices without in any way interfering with her earning capa-

TABLE A.

12,500 S.H.P. Turbo Electric Scheme, 50 Periods.

OIL CONSUMPTION.

Steam Conditions:—
Pressure gauge 200 lbs. per square inch at turbine stop valve.
Superheat 200° F.
Vacuum at turbine exhaust 28½" Mercury (30" barometer).
Boiler efficiency, 75%.
Oil fuel with calorific value of 18,000 B.Th.U. per lb.
Feed water temperature, 220° F.
Steam consumption, 8.35 lbs. per B.H.P. hour, measured at turbine shaft.
Equivalent to 9.58 lbs. per shaft H.P. with an electric drive.
Efficiency of 90% for motor and generator, and 1% for transmission losses.

Fuel Consumption:—
Heat contents of steam at 200 lbs. per square inch, 200° F. superheat = 1512 B.Th.U.
Feed water temperature 220° F. = 188 "
Therefore lbs. of oil per S.H.P./Hr. = $\frac{1512 - 188 \times 9.58}{18000 \times .75} = .78$ lbs.
Assume length of trip 6 days = 144 hours.
Assume 24 trips per annum.
Total S.H.P./Hrs. per trip = 12,500 × 144 — 1,800 S.H.P./Hrs.
Oil consumption per trip = $\frac{1{,}800{,}000 \times .78}{2240} = 628$ tons.
Oil consumption per annum = 15,072 tons.

Lubricating Oil:—
Lubricating oil consumed = 6 gallons per day.
Total per trip = 36 "
Total per annum = 36 × 24 = 864 gallons.

TOTAL RUNNING COSTS PER ANNUM.

Price per ton.	Fuel Oil. Cost per trip.	Cost per annum.	Lubricating Oil. At 3s per gall. Cost per ann.	Total cost per annum.	Increase in running costs compared with 12,500 S.H.P. geared turbine drive.
£2 10 0	£1,570	£37,680	£130	£37,810	£2,760
£2 10 0	£1,884	£45,216	£130	£45,346	£5,512
£2 10 0	£2,198	£52,752	£130	£52,882	£8,864
£2 10 0	£2,512	£60,288	£130	£60,418	£11,416
£2 10 0	£2,826	£67,824	£130	£67,954	£14,968
£2 10 0	£3,140	£75,360	£130	£75,490	£18,520

TABLE B.

GAIN BY OPERATING AUXILIARIES FROM THE MAIN PROPULSION UNITS.

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ity. This, of course, could hardly be the case with turbo-electric drive, because the steamer would require to load three times as much oil and would absorb too much deadweight.

Here is an enormous gain for the motorship not credited by Mr. Scott. We don't know much about running big liners, but we think that two firemen per watch is rather a small staff for a vessel of this power, while Mr. Scott's engine-room crew of 25 men for the motorship is somewhat excessive, and could be reduced to twenty men. Further, we believe that a steamer of this power will carry at least 500 tons of fresh-water for the boilers, if not more, which leaves only 335 tons for Mr. Scott's complete turbo-electric machinery and boiler equipment. This seems far fetched to our mind!

We offer Mr. Scott adequate space in our editorial columns for his reply to our comments. We offer similar space to British and American ship and engine builders for comments on Mr. Scott's claims, favorable or otherwise.

TABLE C.

12,500 S.H.P. Geared Turbine Drive.

OIL CONSUMPTION.

Steam Conditions:—

Pressure gauge 200 lbs. per square inch at turbine stop valve.
Superheat 200° F.
Vacuum at turbine exhaust 28½" mercury (barometer 30").
Boiler efficiency 75%.
Oil fuel with calorific value of 18,000 B.Th.U. per lb.
Feed water temperature 220° F.
Steam consumption 8.35 lbs. per B.H.P. hour measured at turbine shaft.
Equivalent to 8.7 lbs. per S.H.P. per hour.
Efficiency of gears — 96%.

Fuel Consumption:—

Heat contents of steam at 200 lbs. per square inch and 200° F.
Superheat = 1312 B.Th.U.
Feed water temperature 220 F. = 188 "

Therefore lbs. of oil per S.H.P./Hr. $= \frac{1312 - 188 \times 8.7}{18000 \times .75} = .724$ lbs.

Assume length of trip 6 days = 144 hours.
Assume 24 trips per annum.
Total S.H.P./Hrs. per trip 12,500 × 144 = 1,800,000 S.H.P./Hrs.

Oil consumption per trip, $\frac{1,800,000 \times .724}{2240} = 582$ tons.

Oil consumption per annum = 13,968 tons.

Lubricating Oil:—

Lubricating oil consumed = 6 gallons per day.
Total per trip = 36 "
Total per annum = 36 × 24 = 864 gallons.

TOTAL RUNNING COSTS PER ANNUM.

Price per ton.	Fuel Oil. Cost per trip.	Fuel Oil. Cost per annum.	Lubricating Oil. At 3s per gall. cost per annum.	Lubricating Oil. Total cost per annum.
£2 10 0	£1,455	£34,920	£130	£35,050
£3 0 0	£1,746	£41,904	£130	£42,034
£3 10 0	£2,037	£48,888	£130	£49,018
£4 0 0	£2,328	£55,872	£130	£56,002
£4 10 0	£2,619	£62,856	£130	£62,986
£5 0 0	£2,910	£69,840	£130	£69,970

TABLE D.

12,500 H.P. Diesel Engine.

Oil Consumption:—

12,500 × .4 = 5,000 lbs. per H.P.
Trip 5,000 × 144 / 2,240 = 321 tons.
Per annum 321 × 24 = 7,704 tons at 82s 6d per ton = £31,779 0 0

Lubricating Oil:—

12,500 H.P. = 75 gallons per day.
6 × 75 = 450 per trip.
24 × 450 = 10,800 gal. per annum at 3s 6d = 1,890 0 0

Two Auxiliary Generators 150 K.W. Each:—

400 × .4 = 160 lbs. per hour.
24 × 160 × 144 / 2,240 = 247 tons at 82s 6d = 1,018 17 6

Total £34,687 17 6

TABLE E.

Comparative Running Costs and Weights.

(For Twelve Months.)

Diesel.		Turbine Electric.	
Diesel oil at 82s 6d	£34,687	Fuel oil at 60s	£45,346
Engine staff:—		Engine staff:—	
16 engineers, 6 greasers, 1 electrician, 2 frig. engineers	5,376	4 engineers, 3 electrical engineers, 3 greasers, 6 firemen, 2 frig. engineers	3,614
	£40,063		£48,960
		Extra 1,000 tons of cargo for 24 trips at 12s per ton	18,500
			£30,460

Comparative Weights for 12,500 S.H.P.

Diesel. 4.75 S.H.P. per ton	Geared Turbine.	Tons.	Twin Quadruple.	Tons.	Turbine Electric.	Tons.
	8 Quadruple marine boilers	990	8 Boilers, complete with water	990	9 Babcock and Wilcox boilers with water	519
Total, 2,530 tons.	2 - 6,000 H.P. turbine reduction gears	250	2 Quadruple sets	400	2 - 6,000 H.P. motors	126
	Shafting	75	Shafting	75	2 - 5,000 K.W. sets	190
		1,315		1,465		835

Turbine Electric with marine boilers, 470 tons extra.

SIR FORTESQUE FLANNERY AND DIESEL POWER

A statement of great importance was made before the Liverpool Marine Engineers & Naval Architects Society on Dec. 9, by the chairman, Sir Fortesque Flannery, Bart., of the firm of Flannery, Baggalay & Johnson, known as Great Britain's leading and probably most conservative consulting engineers. Sir Fortesque stated that more recently they had seen with intense interest ships with Diesel machinery and he would like to say a word of acknowledgment of the enterprise of the Bibby Line in that regard. Diesel machinery, as many of them believed, was going to revolutionize the means of marine propulsion and marine transport.

Referring to oil-fired geared-turbine vessels Sir Fortesque asked who was there that was not interested in the steam turbine, driven by liquid-fuel fired boilers, steam turbines with double-reduction gear had many successful examples sailing out of the port of Liverpool not yet free from anxiety. (Laughter). If they had charge of two or three ships they would not laugh, they would be thinking about them from time to time!

Following the address by Sir Fortesque Flannery, Professor W. H. Watkinson among other things remarked that the chairman had referred to the introduction of the internal-combustion engine for the propulsion of ships. He had the privilege of being on a trial trip of the largest passenger liner fitted with Diesel engines, and he had no hesitation in saying that the way in which the engines of that ship, the Elder Dempster liner Adda, worked during the trial trip and on the way from the Clyde to the Mersey was really astonishing. They worked without a hitch, and from all indications they would prove exceedingly economical as regarded consumption of fuel.

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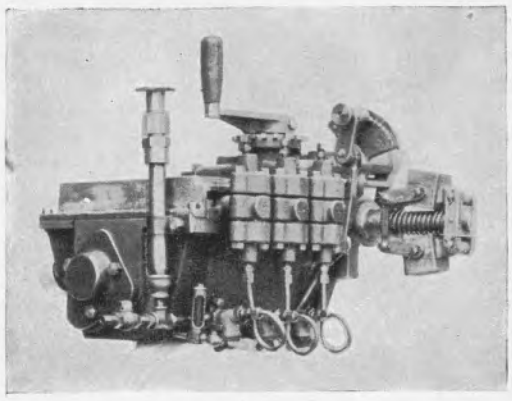
Hammer-Spray Injection System

Details of a New Device for Using Kerosene and Light Fuel-Oils in Conjunction with Low Cylinder Compression

Details of an interesting device for enabling gasoline engines to use kerosene and light fuel-oils such as gas-oil of about 34 and 36 degrees Baumé have been submitted to us by the Hammer-Spray Company of New Haven, Conn., following several years' work on development of the Hasbrouck patents which it incorporates.

The device is in no way intended to take the place of small heavy oil-engines, which the Hammer-Spray Company believe have a great future, but to encourage and assist owners of gasoline-engined craft, not yet won around to oil-engine power to the extent of scrapping their present engines and ordering new plants, to adopt less expensive fuels. Nor is their device intended to induce owners to rebuild their gasoline engines with the idea of making high-compression Diesel engines out of them, nor, of course, is the same economy claimed. The cylinder compression is left unchanged. In fact it is claimed that no structural or mechanical changes at all are required, other than the minor attachment fittings. Furthermore, the device also is intended to form an attachment to small gasoline engines in sizes below that to which heavy oil-engines can profitably be constructed from a commercial aspect.



The Hammer-Spray pump attachment

By referring to the diagram the simplicity of this device will be evident. As the name indicates, the system consists of a spray of fuel injected into the combustion chamber of each cylinder of the engine by a pump by means of a sudden blow of a hammer on the plunger of the pump. The spray-nozzle through which the fuel is injected into the cylinder, may be screwed into place by boring a hole in the cylinder head or other place convenient. To this nozzle flexible tubing is led from a pump the plunger of which is actuated at the proper moment for injection of fuel by a hammer. This is operated by a spring under moderate tension, and by a trip-cam mounted on a shaft driven by means of a belt, chain and sprocket or similar means. Adjustment of the stroke of the pump is regulated by a hand lever, and with proper governing regulation may be very close. Timing of the injection can be varied while the engine is operating.

When the plunger of the pump is driven down by the blow of the hammer the correct amount of fuel is forced through the tubing past a ball-check and injected in a very finely pulverized spray between the seat of the valve and the spherical surface of the valve-head against the tension of the spring. As it mixes with the air in the cylinder it is fired by an ordinary electric spark-plug causing rapid combustion, even when starting from cold or with relieved compression,—states Steven A. Hasbrouck.

Should piston-rings be leaky or the valves need grinding it is claimed that with the Hammer-Spray device it will operate, even though losing compression through these parts. No water is required beyond the usual cooling-water of the engine. It is claimed that according to test and ordinary operating results no carbon deposit remains in the cylinders or on the spark-plugs.

One pump-plunger and one spray-nozzle are required for each cylinder. Control of the pump and thereby the speed of the engine may be carried to the pilot-house of a boat so as to render the same degree of one-man control with this system installed as existing in the case of a gasoline-engine.

Tests of this device have been made by Prof. E. H. Lockwood of Mason Laboratory of Sheffield Scientific School, Yale University, and two installations have been in service on boats at New Haven for many months. Of the tests made, one was in connection with a single-cylinder four-cycle stationary engine of 4⅝″ and 5″ stroke, which operated on 36 degrees Baumé oil and with 25 lbs. cylinder compression, starting cold with relieved compression on the second turn of the flywheel after standing idle for over six months. This engine also operated on alcohol and kerosene with this device installed. A single-cylinder two-cycle marine engine of similar bore and stroke to the above engine was tested by Prof. Lockwood, and is now driving a 23 ft. by 9′6″ converted cat-boat about 5½ miles an hour. This engine starts cold directly on kerosene or fuel-oil on 35 lbs. compression, and the consumption is moderate, one gallon sufficing for two hours and twenty minutes running.

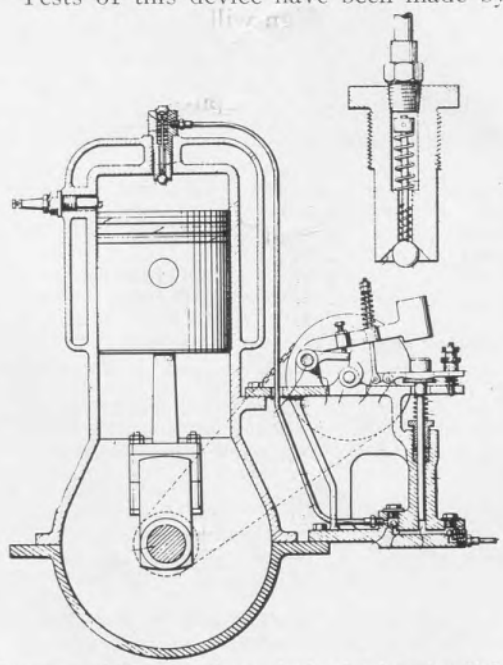


Diagram of Hammer-Spray device for burning light fuel-oils

One of the illustrations shows a full-bodied New Haven oyster boat 49 ft. long, 17 ft. breadth and 5 ft. 6 in. draft equipped with a three-cylinder four-cycle marine engine of 8½″ bore and 9″ stroke. Before the installation of the Hammer-Spray device this engine consumed $240 worth of gasoline per month; her fuel-consumption is now $98 worth of kerosene costing 14 cents per gallon since this device was fitted. The engine operates at the same r.p.m. as before the change. A three-blade Hyde propeller of 38″ diameter and 36″ pitch is turned at 315 to 324 r.p.m. We are advised that for the six months this installation has been in operation in the oyster gathering she has experienced no trouble from carbon deposits nor is any more lubricating-oil required than with gasoline as fuel. She has "starred" (which is a slow operation carried-on over the oyster-beds) for nine hours on 12 gallons of kerosene, this also including two hours running at full-speed to and from the oyster-beds. Her owners are F. Mansfield & Sons, of New Haven, Conn.

OPERATION OF THE MOTORSHIP "MUNMOTOR"

Our readers' attention is drawn to a letter from the Munson Steamship Line on our "Readers' Opinion Page" in this issue, referring to the excellent service of the Diesel-engine installation in the single-screw motorship MUNMOTOR, which was recently converted from steam to oil-engine power.

The center boat is F. Mansfield's New Haven oyster boat. Her 42 h.p. gasolene engine is equipped with the Hammer-Spray device

STATE OF NORTH CAROLINA MAY BUY FLEET

Creation of a State ship and port commission with a fund of $2,000,000 with which to build up State ports and to purchase a fleet of ships, was one of the chief recommendations made by Governor Cameron Morrison, of North Carolina, in his biennial message to the General Assembly.

AMERICAN DIESEL ENGINE OF 35 H.P.

Production of a 3-cylinder Diesel type oil-engine of 35 b.h.p. has already begun at the plant of the Atlas-Imperial Engine Co., Oakland, Calif., and deliveries will begin at once. This small sized oil-engine, which is of the airless-injection type, should be of particular interest to owners of small work-boats, such as fishing craft, etc., as its adoption will make considerable savings in the fuel-bill as compared with steam engines. The manufacturers anticipate considerable business in this sized engine.

CORRECTION

In our article on the Burmeister & Wain plant in the January issue we neglected to mention that the diagram at the top of page 33 represents only the stationary Diesel-engine output of Burmeister & Wain; the output of marine Diesel-engines of the B&W type will be evident from the list given on that page. The illustration of the SELANDIA passing through the Panama Canal was erroneously labeled AFRIKA.

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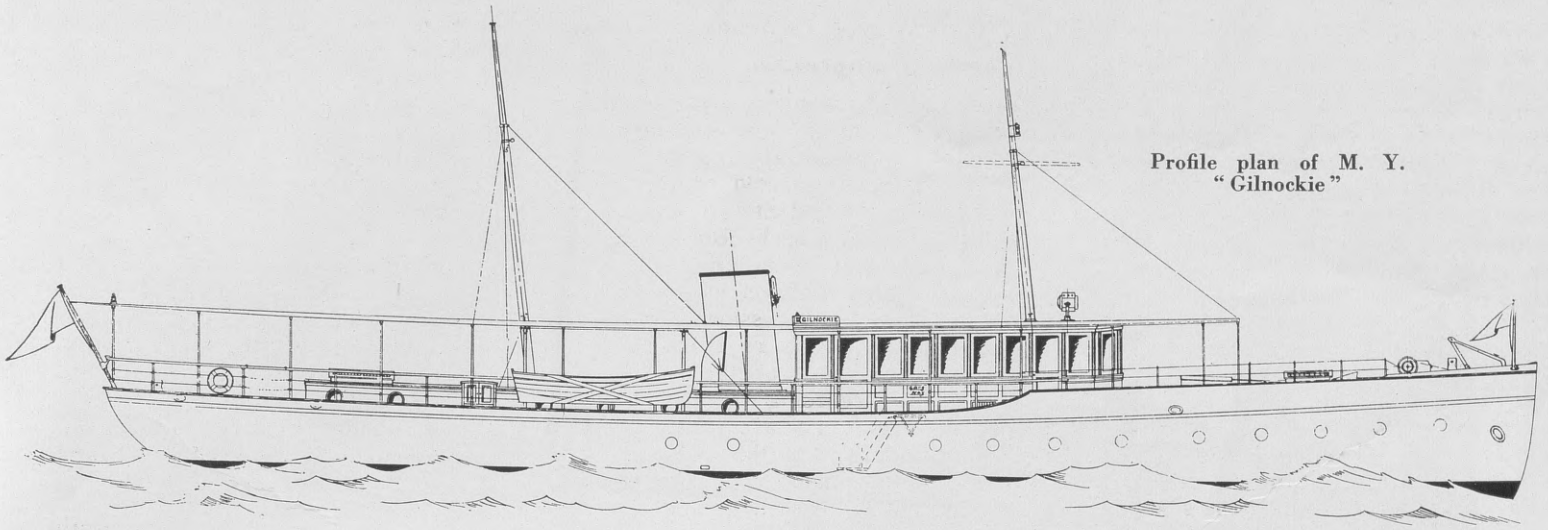


Profile plan of M. Y. "Gilnockie"

"Gilnockie"—Mianus Powered Yacht

Another Addition to the Oil-Engined Pleasure Fleet

AMONG the large motor yachts now under construction to go into service in the summer of 1923 is the twin-screw Mianus-powered yacht GILNOCKIE. She is being built for C. Prescott Knight of Providence, R. I., by the Luders Marine Construction Co. of Stamford, Conn., from designs by J. Murray Watts of Philadelphia. As indicated by the drawings, she is of a wholesome type, varying but little from the usual arrangement and character of motor yachts of this size and embodies features required for long sea voyages. In form it will be noted that she is of a type which has demonstrated seagoing qualities, the ends being balanced, sections deep and the breadth sufficient for proper stability and easy motion. She is of wood construction and of the following dimensions:

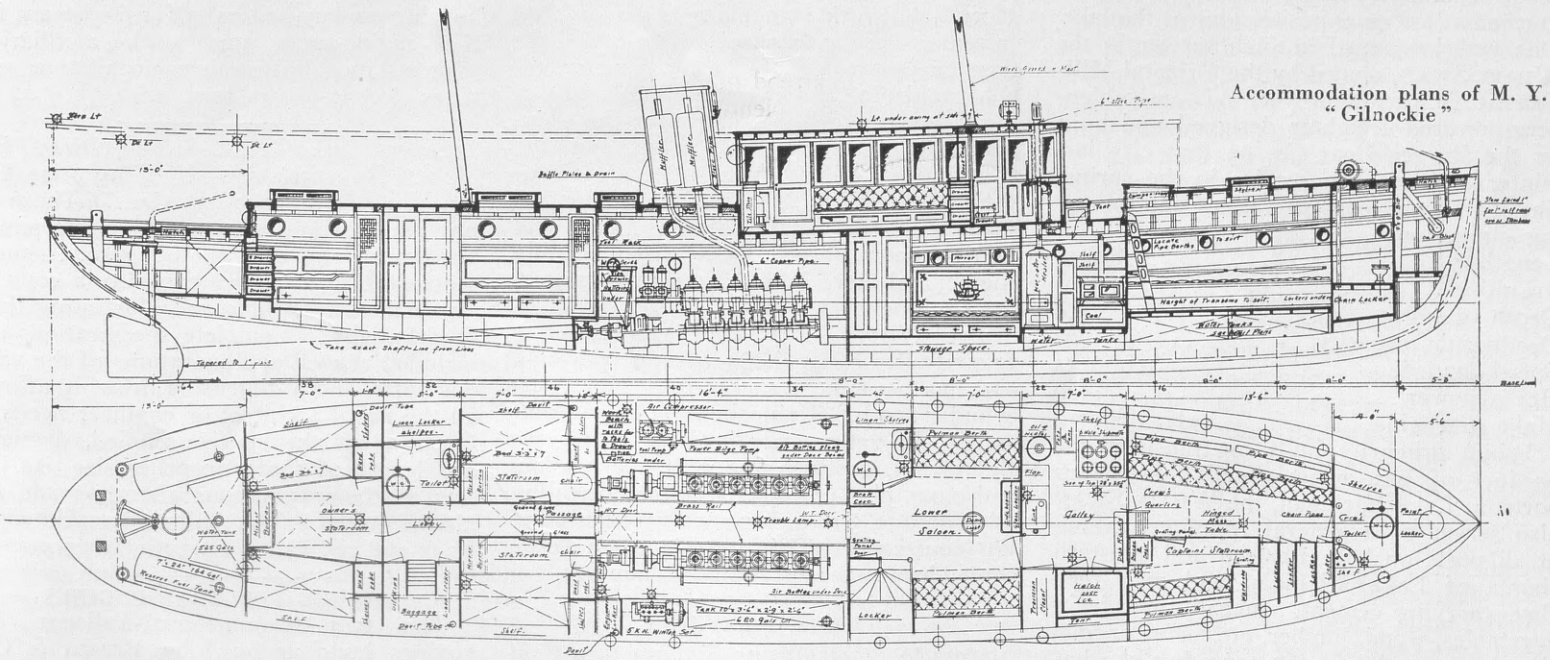
Length o. a.	94′ 0″
Length w. l.	88′ 0″
Breadth	16′ 0″
Draft	5′ 6″
Displacement	87½ tons
Horsepower	240

Two six-cylinder Mianus oil engines of the four-cycle design will be installed, each developing 120 h.p. at 410 r.p.m. and driving three-blade Hyde bronze propellers 44″ diameter and 46″ pitch. A cruising speed of 14 miles per hour may be attained while the maximum is 15 miles. It will be noted that these two engines are installed in an engine room 16′ 4″ long, between steel watertight doors, and that they are equipped with reverse clutches.

On each side of the engine-room are fuel-oil tanks of 1,240 gallons total capacity, these being supplemented by two fuel tanks under the aft deck of 328 gallons total capacity, providing a total of 1,568 gallons of fuel oil. We note that in addition to the two main engines are provided a 5 K. W. Winton electric generating set on the starboard side, which will generate power at 110 volts for electric lights both on deck and throughout the cabins, electric-driven anchor-windlass made by Luders, searchlight, electric fans and service pumps. At the base of the stack is a Sirocco blower which removes hot air from the engine-room, especially appreciated in warm weather. The sanitary pumps and plumbing are by A. B. Sands & Son Co.

An auxiliary Mianus oil-engine driven air-compressor is provided on the port side, to this set being added a Mianus fuel pump and bilge pump. Air bottles are slung under deck on each side of the engine-room. In the aft port corner is a work-bench with racks for tools and spare parts and storage batteries are provided under same. Exhausts of the main engines and auxiliaries are carried out the stack through mufflers, the exhaust-piping being 6″ copper pipe.

For providing hot water there is a Holyoke heater installed in the galley alongside the six-hole Shipmate range. The owner's accommodations are spacious and provide comfort and attractively decorated rooms. The finish is in paneled African mahogany with a scheme of decoration designed along unique lines. Valspar varnish is used throughout. Wireless will be provided. Mr. Knight is Vice Commodore of the East Greenwich Yacht Club, and the GILNOCKIE will prove an attractive and economic addition to the fleet of this club.



Accommodation plans of M. Y. "Gilnockie"

NEW DIESEL DREDGE FOR PORT OF PORTLAND

Arrangements to purchase the last two 750 shaft h.p. McIntosh & Seymour Diesel engines originally built for the Shipping Board have been made by James H. Polhemus, General Manager of the Port of Portland, Ore., for the purpose of installation in a new Diesel-electric driven dredge which will replace the old steam-driven dredge PORTLAND. The engines are at present at Hog Island Yard. When the engines are delivered in Portland minor changes will be made to make them suitable for electric-drive along somewhat similar lines to the McIntosh & Seymour Diesel engines now being installed in five of the War Department dredges.

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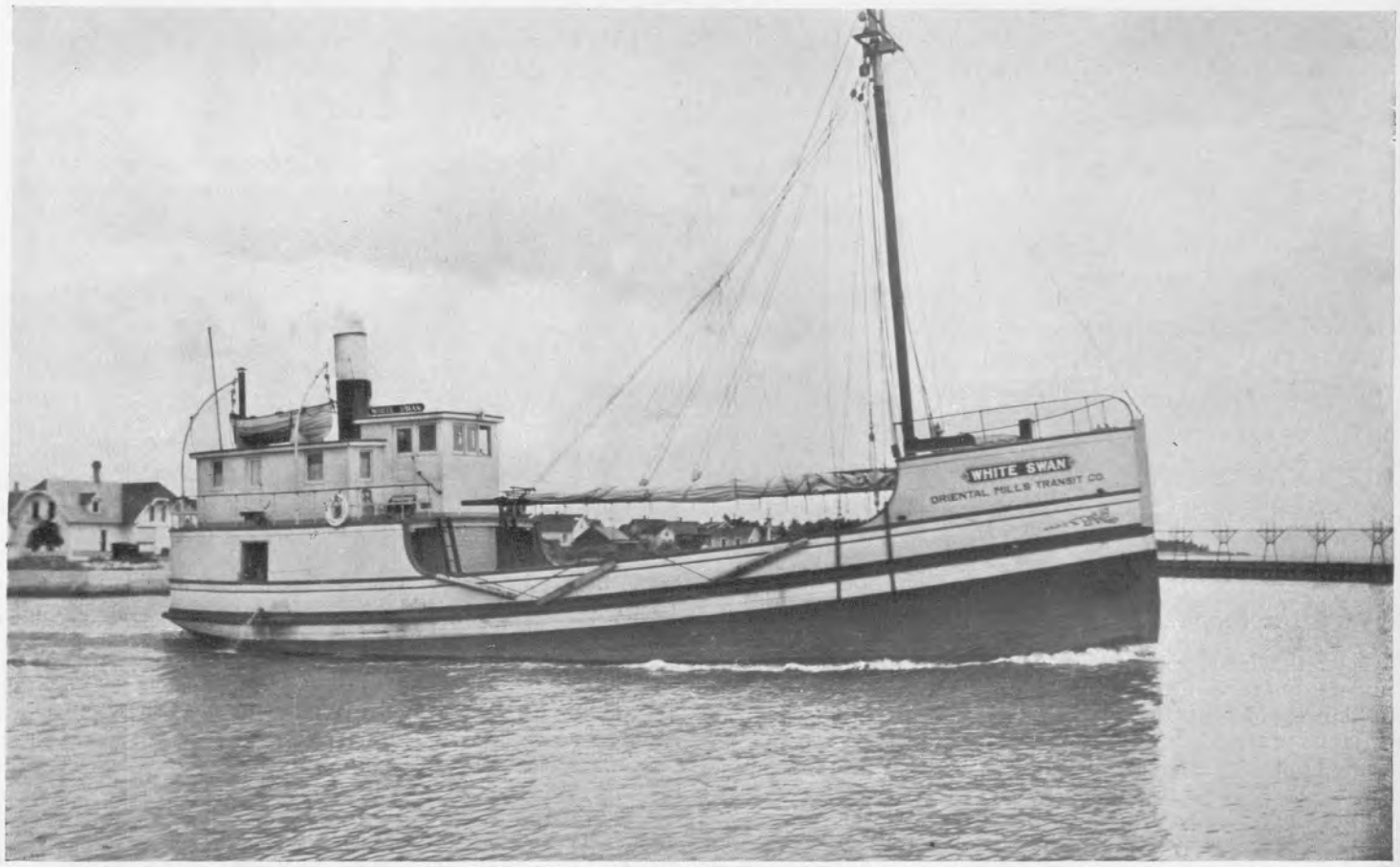

The Kahlenberg oil-engined cargo-carrier under power

"White Swan"—Great Lakes Motor-Freighter

Type of Cargo-Carrier Worthy of Study

IN spite of the fact that ship-owners on the Great Lakes of this country have been somewhat slow to adopt the oil engine for their large ships there are nevertheless a considerable number of smaller craft powered with this type of machinery. Many of these are engaged in general freighting on short runs between several ports, carrying miscellaneous cargo much more speedily and at less cost than the railroads could, especially where the cities touched at are on opposite sides of the lake. One vessel engaged in such service is the WHITE SWAN, owned by the Oriental Mills Transit Co. of Manitowoc, Wis., a Kahlenberg-powered freighter designed and built by the Burger Boat Co. of that city last winter and put into service in the spring. She is of wood construction of the following dimensions:

Length o. a.	85′ 0″
Breadth	23′ 0″
Depth of hold	7′ 0″
Deadweight capacity	160 tons
Speed, loaded	9 miles
Horse power	100
Make of engine	Kahlenberg

While primarily built to transport the product of her owner's mills to various ports on Lake Michigan, the WHITE SWAN also serves as a general freighter, calling at all ports on both Eastern and Western shores of Lake Michigan and on Green Bay, carrying cement, vinegar, salt, fruit, vegetables, wood, lumber, etc. Her normal carrying capacity is 160 tons, but she has loaded as high as 180 tons bringing her deck pretty near the water level. One thousand barrels of salt or very close to this number of barrels of cement can be loaded; when thus loaded her speed is nine miles an hour, while light she makes ten miles an hour.

In construction she is substantial, built entirely of Wisconsin white oak except decks, which are Washington fir, and the joiner work of yellow and white pine. An idea of the scantlings may be had when it is stated that the stem, keel and deadwood are of 10″ siding, the keel moulded 10″, frames 4″ flitch, doubled, moulded 5″ at head and 9″ at keel, spaced 22″ centers, bilge stringers, clamps, shelves 4″ x 8″, ceiling 2″, planking 3″, deck beams 8″ x 10″, decking 3″ x 5″, bulwark stanchions 6″ square; all fastenings are galvanized. She is of the type having raised forecastle, long cargo-hold amidships and engine-room aft. Over the latter are the staterooms for the crew, galley, mess-room, toilets, etc., and the pilot-house is above them. The crew consists of three men, i. e., captain, engineer and sailor. To handle cargo there is a mast and derrick boom served by a Novo hoisting engine, and there is an American Engineering Co. anchor windlass.

The WHITE SWAN has run close to 10,000 miles since she went into operation and has been most successful. Her four-cylinder 100 h.p. Kahlenberg oil engine consumes six gallons per hour of 24 degree Baumé oil, costing nine cents per gallon, and 0.025 pint per h.p. hour of lubricating oil (equal to 3.12 gallons per ten-hour run) are consumed. The propeller is a four-bladed bronze wheel 48 inches diameter.

CURRENT REVIEWS

How to Start Marine Engines in a Cold Ship. By W. J. Woodcock. Published by Spon & Chamberlain, New York. 153 pages. 1922. Price $3.00.

We have perused this pocket-size manual of operation for marine engineers of both steam and motor-vessels without our enthusiasm being aroused. A book of convenient size, giving in simple language step by step the routine of operation of marine machinery is always welcomed by engineers particularly by assistants and oilers ambitious to forge ahead. Of the chapters on steam-engine operation it is outside our province to judge, but we do feel that the chapters devoted to the "semi-Diesel" and Diesel-electric propulsion require re-writing. Many statements are far from correct, as we find the facts in motorships and engines in service. We also do not feel that the author has selected the best example of so-called "semi-Diesel" drive that featured in the book having two oil-burning donkey-boilers to furnish steam for the engine-room and deck auxiliaries whereas the most modern installation provides electric-driven auxiliaries.

Enterprise Airless-Injection Diesel Engines. Bulletin issued by Enterprise Engine Co., San Francisco, Calif. Those of our readers interested in oil-engine power for workboats, etc., up to 300 h.p. should secure from the above company a copy of a pamphlet describing and illustrating their Diesel-engine. Complete specifications are included as well as illustrations of the various parts, and a dimension drawing affords all the naval architect or engineer needs to know about the space occupied, diameter and length of shaft, propeller size, etc. A few of the installations already made are also featured. The bulletin is printed in black and red and is attractively prepared.

THE BIG FULLAGAR ENGINES

The twin Cammellaird-Fullagar oil engines building by John Brown & Co. Clydebank, Scotland, for a Japanese motor ship referred to on page 27 of our January 1923 issue, are of 2250 shaft h.p. each, not 2,500 s.h.p. as stated. They are six cylinder, two-cycle sets 22″ dia. with 33″ stroke of each piston, or 66″ total stroke. Tests of one unit have been run.

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Pioneer Oil-Engined Passenger-Boat on Lake Erie

The "Lakeside III" with a Dodge Engine Proves Complete Success

Oil-engines are distinctly suited to passenger-service not only because of economy and reliability but also because of safety. For many years, since the advantages of the internal-combustion engine have been realized, the small steam-launch in this service has steadily diminished in numbers. Their places have been taken by motor boats driven by gasoline engines. But gasoline is a highly inflammable fuel and costly and it is not surprising that Diesel and oil-engines are superseding those burning this fuel. The use of oil-engines has been confined largely to craft of the smaller sizes, but larger passenger craft will be so equipped as the advantages are more fully realized.

However, there is an exceedingly large field in the smaller craft, as every river, lake or bay of any considerable size has its passenger-launch. W. R. Brown of Lakeside, Ohio, proprietor of the Lakeside Launch Service at the Sandy Beach fishing and bathing resort, formerly operated a gasoline passenger-launch, but on Sept. 10, 1921, she was destroyed by fire and Mr. Brown advises us that when it came to replacing her for the 1922 season he decided there should be no gasoline on board. He, therefore, investigated the oil-engine field and finally purchased a 50 h.p. Dodge oil-engine to be installed in a hull which he ordered from the Sandusky Boat and Cabinet Works of Sandusky, Ohio. This first oil-engined passenger-boat on Lake Erie was designed by Harry Darst and her keel was laid on Feb. 27th and she was launched on June 10, 1922. Her dimensions are as follows:

Length o. a.	62′0″
Breadth	15′0″
Draft	4′0″

Her Dodge oil-engine has four cylinders and turns a 36-inch towing propeller which drives the boat 9 knots. All auxiliaries, such as fuel, bilge, air-compressors and electric-light plant are driven off the propelling-engine. No gasoline-engine driven auxiliaries as often installed are found on the LAKESIDE III.

Fuel-oil is not readily obtainable in large quantities at the scene of the boat's service, therefore, a higher price than usual was paid for the 30 degrees Beaumé oil used. In spite of this handicap a saving of $580 was effected as compared with what it would have cost to operate the boat with a gasoline-engine for the short season of four months. The absence of gasoline on the boat was a feature greatly appreciated by the patrons of the service.

She is equipped for carrying 250 passengers during the summer season and in the fall made several trips from the islands off Sandusky to Detroit, Mich., and Lorain, Ohio, carrying 1,200 bushels of fruit each trip. She is handled by one man from the pilot-house, engine controls being carried to this point. One deck hand in addition to the operator completes the crew. Partly because of the successful operation of the LAKESIDE III another 50 h.p. Dodge oil-engine was installed in a fish-boat, also replacing a gasoline-engine.

The Dodge-engined passenger-boat "Lakeside III"

Forged or Built-up Crankshafts

By D. M. Shannon

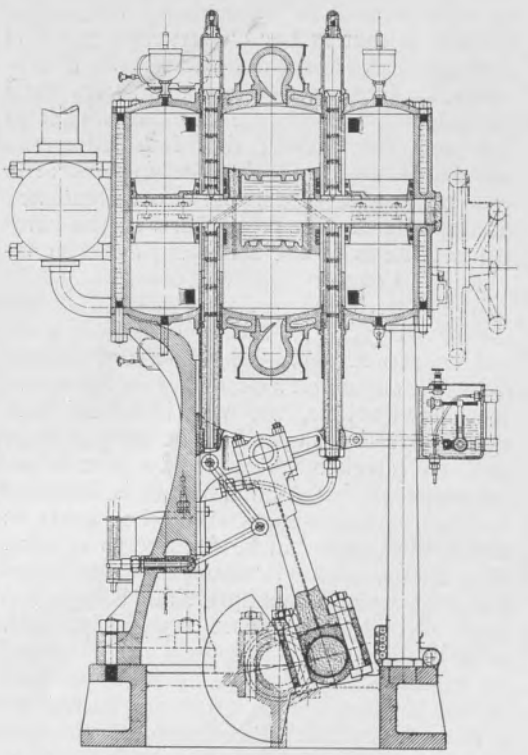
Solid crankshafts have failed simply because they have been too highly stressed. One large shaft that gave out showed calculated stresses of over 8,000 lbs. per square inch. With ordinary steels this should be kept down to 5,000 lbs., and if the bearings are kept in reasonable alignment I prefer the solid shaft to the built shaft. Built shafts are a relic of the days when sound forgings of the required size could not be satisfactorily produced. It should now be realized that metallurgists have progressed much, and careful tests made on a large C.F. engine crankshaft with pieces cut from the junctions of the crankpins and main bearings with the web have shown the metal to be almost uniform in quality throughout. The shrinkage fits allowed on built shafts are such that the material of the webs is stressed to the elastic limit, and I have always wondered why marine engineers, who are as a rule very conservative with the stresses on all parts of the machinery, are prepared to start off with the most important part of their engine stressed to nearly breaking point.

Crankshaft troubles can be avoided by having a short engine, stiff engine seatings and bed-plate, low crankshaft stresses and keeping the bearings in line. Generally speaking, there are far more solid crankshafts running today than built ones.

DOUBLE-ACTING SURFACE-IGNITION OIL ENGINE

A lengthy descriptive article on the new Reed double-acting oil-engine of the hot-bulb type of surface-ignition oil-engine appears in the December issue of the magazine *Industrial India,* published in Great Britain. This engine is novel in several respects, also is probably the only surface-ignition engine working on the double-acting principle. The ordinary piston-rod is entirely dispensed with, the design embodying a double-acting piston.

As will be seen by the section the motion is carried from the piston to the crosshead



Section of the Reed double-acting, surface-ignition type oil-engine

by means of two side rods attached to a piston pin passing through a piston. By this method the stuffing box usually to be found with double-acting engines is eliminated. The makers claim a mean effective pressure of 60 pounds per sq. inch. The consumption is said to be 0.48 lb. per shaft h.p. hour on engines over 100 h.p. and a consumption of ½ lb. per shaft h.p. hour on engines under 100 h.p.

The first engine constructed develops 30 b.h.p. in two double-acting cylinders on a weight of 2,464 pounds and is 40 in. high from the crank-shaft centers. Being of the two-cylinder type it has been possible to fit a very simple reversing device. Each cylinder has 6″ bore by 8″ stroke and the engine develops its regular load at 300 r.p.m. The manufacturers are the Reed Patent Engine Co., Hythe, Southampton, England.

The two 258 ft. New York State Canal freighters for the McDougall Terminal Warehouse Co., Duluth, Minn., will be built at the Detroit yard of the Great Lakes Engineering Works. Twin 375 shaft h.p. Lombard Diesel-engines in conjunction with electric drive will be installed, as published in our December issue. There will be an 80 b.h.p. auxiliary oil-engine in each boat. The vessels are from designs by Henry Penton, Cleveland, Ohio.

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Performance of First Washington-Estep Engine

Tug "Elmore" With 110 H.P. Engine of This New Type Runs Trials and Goes Into Service

IN our July, 1922, issue we described the new Washington-Estep airless-injection Diesel-engine and mentioned that the first installation of this new product of the Washington Iron Works was being made in the tug ELMORE owned by the American Towboat Co., of Everett, Wash. This company is one of the oldest and most progressive firms in towing work on Puget Sound, owning and operating 24 tugs, the latest three installations being oil-engines. The ELMORE has been completed and put in service and an exceedingly interesting feature is that in her construction the keel and frames of the old steam tug R. P. ELMORE, built over 20 years ago, were used in order to incorporate her fine model in the new tug. With this foundation the new boat was built by the owners at a cost of $45,000 under the superintendence of Capt. Harry Ramwell, head of the company. She is of the following dimensions:

Length .....76′—0″
Breadth .....17′—0″
Draft ..... 9′—0″

Her 110 h.p. Washington-Estep airless-injection engine was described in the above mentioned article, but we will repeat here that it has three cylinders of 10 3-4″ bore and 16″ stroke. Accessibility is a characteristic of this engine, which is intended for use in work-boats and other craft in which little time can be devoted to repairs. The fuel-pressure is unusually low, 1,500 lbs., the cylinder-compression being 350 lbs. Cylinders are cast separately, each with its detachable liner and are mounted on an entablature formed at the upper part of the frames. The latter are bolted together, the cylinder-liner extending through the entablature. There are two fuel-injection valves in each cylinder-head and an individual fuel-pump supplies each pair of injectors of each cylinder. Starting is from cold, a simple water-cooled air-compressor being mounted at the after end of the engine for charging starting-air tanks at 150 lbs. pressure. Inlet and exhaust valves are fitted in the cylinder-heads, long vertical rod and overhead rocker drive from the camshaft being provided, the latter being mounted at half height on the front of the engine. A multiple-disc mechanical reverse-gear is installed. For lubrication a force-feed system with Manzel mechanical oiler is provided.

On the trial-trip of the ELMORE a run was made from Everett to Gedney Island and return, a distance of ten miles, over which course her engine drove her at a speed of 8.57 knots, faster than the 150 h.p. steam-engine had driven the R. P. ELMORE of identical model, although the new boat has two feet higher freeboard. On this trial she burned fuel at the rate of five gallons an hour and lubricating-oil at the rate of two gallons per 24 hours, both economical figures. Manoeuvring was entirely satisfactory and the power developed on the trial was 110 h.p. at 250 r.p.m. Prior to her trial-trip the ELMORE ran to Point Wells for fuel, a round trip of 36 miles, the return trip being made against a blinding snow-storm, against very heavy seas and a strong wind, conditions such that steering had to be done by compass. Few new installations are tried out under these conditions.

The ELMORE is a representative motor-tug suitable for coastwise work, able and sturdy. Her propelling-engine is installed on sister-keelsons extending the full length of the boat, the solid foundations eliminating vibration. Fuel-tanks of 3200 gallons, sufficient for 26 days of 24 hours, while two 80 gallon tanks are provided for lubricating-oil. For lighting the tug a 4 h.p. 32 volt Regalite system is provided, while a power-windlass and towing-machine are installed. Forward of the engine-room is a fish-tank or cargo-hold and forward of this compartment is the fore-peak, containing a 600 gallon water-tank. In the main-deck house are two staterooms forward, aft of these the upper engine-room gratings, toilet-room, and galley and mess-room. Two staterooms are aft of the galley, one to be used for a wireless-set. Aft of the pilot-house is a texas containing the captain's room.

ECONOMIES TO BE EFFECTED BY CONVERTING THE "SEEKONK"

Checking up our article on the conversion of the steamer "Seekonk," on page 836 of our December number, we discovered a clerical error. The annual saving of fuel was given as 3,382 tons or 141,044 tons of oil having a value of nearly $150,000. Probably some of our readers have noticed that this figured-out at 4.463½ tons (31,244 barrels), or a saving of $46,866 with oil at $1.50 per barrel. The quoted daily saving of 20 tons of oil at sea and 4½ tons in port stands correct.

"EDIBA," A 6,400 I.H.P. HARLAND B. & W. ENGINED MOTORSHIP

Another high-powered motorship for the Elder Dempster Company was launched on Dec. 7th at Harland & Wolff's Govan shipyard for cargo and passenger service. The EDIBA as the craft has been named, is a three-decker of 6,500 tons gross, with seven W. T. bulkheads dividing the hull into eight compartments. The engines are installed about 'midships, and consist of two 3,000 i.h.p. eight-cylinder, four-cycle Harland & Wolff Burmeister & Wain type Diesels turning at 115 r.p.m.

There are five cargo holds, each of which is fitted with large heatchways. The vessel is fitted with two steel masts, the topmasts of which are telescopic, and two derrick posts, also 17 strongly built steel channel derricks of the builders' special type, rigged in the most approved manner for the rapid handling of cargo. In addition to these derricks there is one fitted abaft the foremast suitable for lifting loads up to 50 tons. The steering-gear, the windlass, and 11 winches are all electrically driven. A powerful wireless telegraphy installation will be fitted.

Tug "Elmore," powered with Washington-Estep oil-engine

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French Motor-Tanker Visits New York

Werkspoor-Engined Vessel "Jules Henry" Completes Eight Years of Most Satisfactory Service

MANY years before the urgent demand for ships brought about by the war, occasionally vessels were lengthened to increase their earning-capacity, and sailing-vessels were fitted with oil-engine power to render them independent of wind and tide. When a sailing-vessel has been fitted with oil-engines as auxiliary power great interest attaches itself to the general character as well as to the details of the new installation, but when such a vessel is both equipped with power to the exclusion of sail as well as lengthened, interest is even more keenly aroused. Such a vessel is the French tanker JULES HENRY, owned by A. Vimont et Cie of Marseilles, built by the Société Anonyme des Forges et Chantiers de la Mediterranée, of Havre, in 1900, and converted into a full-powered craft in 1913 at Wilton's shipyard, Rotterdam, Holland. At the same time that two 500 brake h.p. Werkspoor crosshead-type Diesel-engines were installed the hull was lengthened from 251 ft. to 304 ft., an increase of 53 ft., her present dimensions being:

Displacement	5,150 tons
Deadweight capacity	3,400 tons
Length	303′ 8″
Breadth (m. d.)	40′ 0″
Depth (m. d.)	23′ 6″
Power	1,000 shaft h.p.
Daily fuel consumption (including boiler)	4½ tons
Bunker capacity	295 tons
Cruising radius	80 days

By the reconstruction and increase of length of this vessel a net gain of 400 tons was effected, the present net-cargo capacity being 2,800 tons, in addition to fuel, etc., as against 2,400 tons before the reconstruction. This cargo is carried in seven tanks arranged so that three different kinds of oil may be carried, each being separated by a cofferdam. These tanks extend from the forecastle, where the sailors are accommodated, aft to the engine-room. On the weather-deck just abaft amidships is the pilot-house, wireless-room and navigating-bridge over the captain's and officers' quarters, galley and store-rooms. Aft over the engine-room are dining-room for the officers, pantry, engineers' and other officers' rooms.

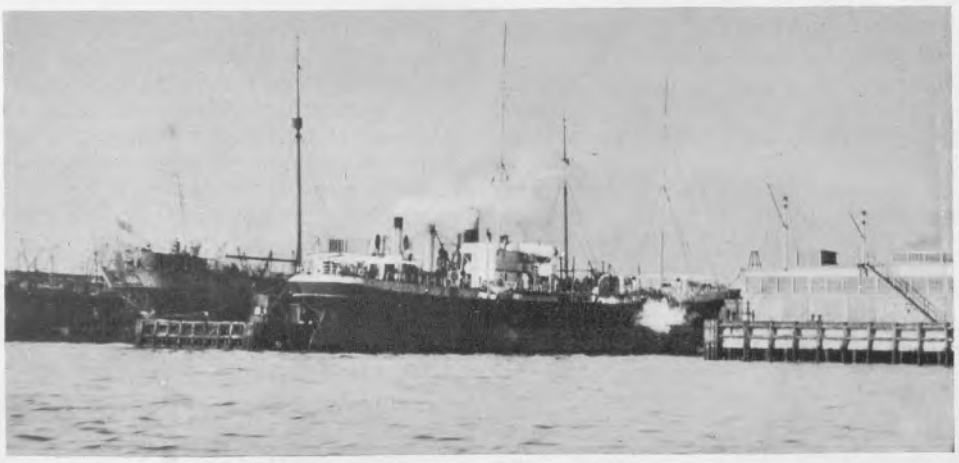
When this tanker recently called at the Standard Oil Co.'s refineries at Bayonne, N. J. (New York harbor) to load a cargo of refined oil for Marseilles we went on board and inspected this vessel and her power-plant, through the courtesy of her master, Captain Tulli and Chief Engineer Gaillard Casimir, and of the Standard Oil Co. of N. J.

The chief proudly informed us that on the voyage over from France her engines ran for 25 days without an involuntary stop, and with complete assurance stated that he would run them for 20 days without stopping on the return to Marseilles fully loaded. She has made many voyages, among them seven to America.

The engine-room installation is unique and noteworthy, differing in many respects from many we inspect. Two 675 indicated h.p. Werkspoor Diesel-engines having six cylinders of 420 mm. (16.535″) bore and 600 mm. (23.622″) stroke of the four-cycle steel-column construction and crosshead type are installed as far aft as the form of hull will permit. Few Diesel builders adopt crossheads and short pistons for engines of this power, the trunk piston being most generally used. Special stiffening of the framing of the vessel in the way of the engines was made which eliminates vibration. These engines operate normally at 180 r.p.m. and deliver about 500 shaft h.p. each. Whereas larger Werkspoor engines are fitted with water-cooled pistons, these engines in the JULES HENRY have air-cooled pistons. Another point of considerable interest is that both engines are controlled from a position on the grating level with the top of the cylinders on the starboard side of the engine-room, all levers and controls for both engines being brought to this point. The recorders of the engine-room telegraph system are located here, while immediately aft is the switchboard. Each engine has but one fuel-pump and each pump is capable of acting as a stand-by for the other engine; therefore, in case of trouble, one pump can serve both engines, this system being installed on other Werkspoor-engined craft. The two pumps deliver fuel-oil to a balanced high-pressure steel bottle near the top of the engine-room trunk, maintaining a constant-level reservoir, and containing about 15 minute's supply, so if a pump is put out of action the engine will not stop.

Officers of motorship "Jules Henry." Capt. Tulli (on right) and Chief Engineer Casimir (on left)

A Cochran donkey-boiler of 3′ 9″ diameter, 7′ 6″ high with a heating surface of 85 sq. ft. is installed aft of the propelling-engines for furnishing steam for engine-room and deck auxiliaries. This boiler is fitted with the Wallsend-Howden system of oil-burning and the up-take is carried to the after funnel of the ship, the forward funnel serving for the exhausts from the main-engines. Deck auxiliaries consisting of anchor-windlass, winch on the poop-deck, steam steering-engine and the cargo-pumps; in the engine-room are an auxiliary Reavell compressor for charging air-bottles and to act as a stand-by to the injection-air pump, independent steam-driven pumps for cooling-water, bilge, sanitary and fuel-oil services. A steam-engine manufactured by the Ateliers d'Automobile et d'Aviation of Paris is situated at the forward end of the engine-room, this engine driving an electric-generator of 110 volts, 30 amps. at 700 r.p.m. The latter was made by the Ateliers G. Heiser of Suresnes. For pumping oil-cargo there are two Worthington steam-pumps 9½″ by 8½″ by 10″ capable of handling about 100 tons of oil per hour, and for pumping the contents of tank No. 1 there is a special steam-pump of Worthington type 6″ by 7½″ by 6″ for handling benzine. All three pumps can work together to discharge the contents of all the tanks. Both engines and donkey-boiler use the same fuel, of which 295 tons (sufficient for 80 days at full power) are carried, the consumption per day for all purposes being 4½ tons. Six tons of lubricating-oil are provided. The crew consists of captain, three mates, chief-engineer, second engineer, third enginer, ten greasers, chief-steward, second steward, wireless operator, boatswain, cook, second cook, storekeeper and ten sailors.



French motorship "Jules Henry" at Standard Oil Dock, Bayonne, N. J.

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Quarantine Boat "Bratton" Runs Trials

Government Officials Pleased With New Installation

On December 13 the official trial-trip of the U. S. Quarantine boat BRATTON was held following the installation of a four-cylinder 100 h.p. Fairbanks-Morse oil-engine. This boat is one of the former U. S. Army wooden tugs and was equipped with a 125 h.p. gasoline-engine. Following a fire on board, the gasoline-engine was removed and the Fairbanks-Morse oil-engine installed at the yard of the New York Harbor Dry Dock Company, Staten Island, under the direction of J. G. Cubberly, in charge of the service department at the New York office of Fairbanks-Morse Co., the work being done by N. C. Rayner, one of the installation engineers for Fairbanks-Morse.

This boat is of the following dimensions:

Length	64′
Breadth	16′
Draft	7′

The official trial was run by the Floating Property Board of the U. S. Quarantine Service, consisting of Capt. J. J. Dillon, Dr. B. E. Holsendorf, and Dr. J. D. Reichard; Capt. A. B. Frey, supervising chief-engineer of the Supervising Architects Office, New York, also being present as observer.

Through the courtesy of T. W. Drennen of the Marine Sales Department of Fairbanks-Morse we were invited to be present at the trials, which were held in the lower harbor, continuing for three hours. During this time the engine operated absolutely without vibration, partly owing to the solid oak engine foundations which were fitted, and the fuel-consumption worked-out at 7 gallons per hour. The fuel used was Texas Company 33 degrees Baumé, 174 degrees F. flash point. As near as could be estimated over the distance run a speed of 10 knots was realized.

We noted a new feature on the Fairbanks-Morse installation, this being a lubricating-oil refining system which enables the Fairbanks-Morse Company to guarantee 1,000 h. p. hours on lubricating-oil on any of their engines. The lubricating-oil used on the BRATTON was D.T.E. medium heavy.

In addition to the propelling engine there is a Fairbanks-Morse 1½ h. p. oil-engine driving a 3″x3″ air-compressor at 500 r.p.m. developing a pressure of 175 lbs. The fuel-tank capacity is 526 gallons in two tanks installed on either side of the engine. A three-bladed bronze propeller 48″ diameter by 38″ pitch seems to be exceedingly well suited to the boat, as she picked up speed quickly when the engine was started on leaving the dock and moved at a steady speed, manoeuvring very quickly and with a small turning radius.

The engine will be run in the quarantine service by Alfred Hartman, an experienced steam engineer, just entering into operation of oil-engines, and he advised us that the latter was much to be preferred from an operating standpoint to the steam engine. The BRATTON will be used in the work of fumigating vessels in the New York harbor, her headquarters being at the quarantine station, Rosebank, Staten Island.

U. S. Quarantine Boat "Bratton."

New Coastwise Motor Freighter

Eastern Transport Co. to Build 100-Footer

The Eastport Transport Company of Eastport, Maine, is having constructed at the Baltzer Boat Works of that city a 100′ wooden freighter to be equipped with a 60 h. p. oil-engine, make of engine not yet selected, to carry about 200 tons of mixed freight, principally sardines, between Eastport, Maine, and Boston, Mass., stopping at several towns along the Maine coast which have no railroad connection. This new boat will have the following dimensions:

Tonnage	100
Overall	100′
Length of keel	75′
Breadth	26′
Depth	9′6″

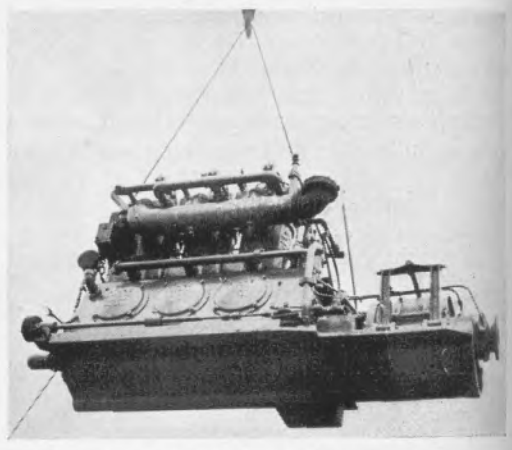
Three masts fitted with sails will be provided to help out when a favorable wind blows and a crew of six men will be carried. The manager of the company which will operate this new freighter, H. F. Burpee, operates fourteen motor-freighters on the route along the St. Croix River carrying sardines between Eastport and St. Andrews, N. B., connecting with the Canadian-Pacific Railroad at that port. It will thus be evident that the new oil-engined freighter can economically transport freight between points in Canada to such ports as Portland, Maine, Boston, Mass., and other cities on the coast in this section.

It is the intention of the company to construct other similar craft if the operation of this new freighter meets expectations, and we believe that when this new craft is placed in operation in the Spring that it will form an important link in the coastwise transportation of canned sardines, one of the principal products of the Maine coast.

DIESEL-ENGINES IN BRITISH COLUMBIA IN WORK-BOATS

While surface-ignition and hot-bulb oil-engines have been in use in British Columbia for many years, Diesel-engines have not been heretofore adopted for marine propulsion. In the principal industries of lumbering, mining, canning and the fisheries a large number of boats of various type are necessary; in the fisheries alone during 1921 there were registered 3,002 small motor-boats, 144 others of between 10 and 20 tons and 86 of over 20 tons. In addition to these there are about 3,000 sail and row boats in the fisheries. Oil-engine power has been perhaps most extensively used in the cannery-tenders, craft which are engaged in arduous service.

One of the largest operators of canning plants is the Anglo-British Columbia Packing Co., whose fleet of tenders consists of many boats ranging from 50 feet to 80 feet, many of which are equipped with Imperial distillate engines. Three years ago this company installed their first oil engine, of 100 h.p., in the 80-foot cannery tender FIR LEAF. As compared with the fuel expense for the 55 h.p. distillate engines in their 62-foot tenders the company found that the latter cost $2.25 an hour for fuel and lubricating oil, while the oil engine only cost 85 cents an hour on this same basis, although developing practically double the horse power. Fuel for the distillate engines cost 24 cents a gallon and for the oil engine 6 cents a gallon. So decided were the economies effected by the oil engine that this company has now replaced the 55 h.p. distillate engine in their 62-foot by 16-foot tender LAUREL LEAF with a three-cylinder Atlas-Imperial Diesel engine purchased through this company's agents, Ferrier & Lucas, of Vancouver.



The 55 h.p. Atlas-Imperial oil-engine of the "Laurel Leaf"

Capt. J. A. Cates of Vancouver is one of the pioneer steamship operators of British Columbia, having put into service many years ago steamers running between Vancouver and Howe Sound. A few years ago he sold his steamer interests to the Union Steamship Co. of British Columbia, and he is now operating tow-boats. Just as he was a pioneer in operating steamers so he is in adopting Diesel engine power for towing in these waters, for his new tow-boat just completed at Vancouver is the first Diesel tug in British Columbia. She is 60 feet long, 15 feet breadth and 7 feet draft, and her fuel capacity is 1,500 gallons of fuel. A four-cylinder 90 h.p. Atlas-Imperial Diesel engine purchased through Ferrier & Lucas is to propel this tug.

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New Ferries for New York City

Diesel and Steam Drives Being Considered

Plans and specifications for the construction of eight new ferry boats to cost $1,475,000 have just been submitted to the Board of Estimate, City of New York, by Grover A. Whalen, Commissioner of Plant and Structures. Five of these craft will cost $925,000 and three will cost $550,000. Both steam and direct Diesel drive are being figured upon—Diesel-electric drive apparently having been abandoned.

Discussing the question with Deputy Commissioner W. W. Mills, we asked him as to what influence the probable extra cost of approximately 30 per cent. of Diesel engines over steam would have on the adoption of this economical type of power, and were advised that this would be of less importance than the question of the Department being satisfied that American engine-builders have a Diesel engine which can be reversed quickly enough, and there seems to be difficulty in inducing the engine-builders to guarantee a reversing speed equivalent to that of steam.

It is not easy for us to understand this, because we know that Diesel engines in most merchant ships reverse from full-ahead to full-astern from anything from five to twelve seconds in the hands of capable operators. It is to be hoped that engine-builders will be able to satisfy the Department on this point, and that Diesel drive will be adopted for these eight craft.

SIX POWERFUL MOTORSHIPS AND COMPETITION

We have often referred to the new fleet of six 14,000 tons, 6,250 ind. horsepower, 12½ knot cargo, fruit and passenger carrying motorships operated between the Pacific coast of North America and Europe jointly by the Royal Mail & Holland America Lines. The last two of these vessels will soon be in service. They only burn 18 tons of fuel per day each. The fleet is as follows:

Royal Mail Line	*Holland America Line*
LOCHKATRINE	DINTELDYK
LOCHGOIL	DRECHTDYK
LOCHMONER	Un-named

These vessels are so economical in operation that American *steam*ships simply cannot successfully compete against them, consequently, they are carrying large quantities of American products to Europe, much of which should be transported in American hulls. The only way for American shipowners to secure their share is to adopt Diesel power in slightly faster ships, and the U. S. Government should encourage and assist the building of such a fleet, as urged by MOTORSHIP in a communication to Chairman Lasker of the Shipping Board over a year ago.

COMBINED LIGHTER AND TUG ORDERED

Interest in the operation of an oil-engined tug described some time ago in MOTORSHIP weighed considerably with the Cuban-American Sugar Company of New York when laying-out their plans for a new combined lighter and tow-boat designed for them by Cox & Stevens. The contract for this vessel has been awarded to the Vinyard Shipbuilding Company of Milford, Del., while the order for the Diesel engine has gone to the Winton Engine Works, Cleveland, Ohio. The engine will be of 225 b.h.p. The vessel is 90′ length overall, by 22′ breadth and 8′ draft, and further details will appear in our March issue.

BIG OIL-ENGINED AIRSHIP

Prof. Junkers, of opposed-piston oil-engine fame, has collaborated with Herr Dorn in the design of a large flying-ship of 1,000 tons displacement capable of traveling either in the air or at sea. The power equipment will consist of four airless-injection oil-engines, and the craft is intended for service between Europe and the United States. Several hundred passengers in addition to crew will be carried. However, we doubt very much the success of such a project at this stage of airship development. Even if such a vessel did succeed in crossing the Atlantic, we doubt if many trips would be made before disaster occurred.

ARMOUR'S SCHOONERS

At present nothing will be done in the way of fitting auxiliary oil-engines in the two wooden schooners owned by the Armour Fertilizer Works, 209 W. Jackson Blvd., Chicago, Ill.

Some large motorships now under construction.

Owners.	*Tonnage.*		*h.p. of Diesels.*	*Speed.*
Hamburg, South American Line	12,000	tons gross	6,000	13¼ knots
North German Lloyd	9,500	" "	5,000	13½ "
Axel Bostrom	22,000	" d.w.	5,000	18 "
Union Steamship Co.	20,000	" gross	13,000	11½ "
Elder Dempster Co.	6,500	" "	5,250	12¾ "

NEW SPANISH SUBMARINES

It has not yet been decided whether Nelseco Vickers, Augsburg, or Armstrong-Sulzer Diesel-engines will be installed in the six new 900 ton submarines to be laid down by the Spanish navy at the Cartagena dockyard from American designs. In the four of the series of six 550 tons submarines nearing completion Nelseco Diesel-engines are installed. The other two sets of Diesel engines will be built at the plant of the Constructora Navale, Sestro, New Bilbao, a Vickers subsidiary, which incidentally represents in Spain the Westinghouse Mfg. Co. of East Pittsburgh, Pa.

DIESEL-DRIVEN TUG OF 1,000 H.P.

One of the highest powered Diesel-driven tugs in the world, and one of the largest in Germany, was launched on Dec. 16th at the Norderwerft, A-G, Hamburg. She is a twin-screw sea-going craft built to the order of the Bugsier-Reederei und Bergungs, A-G and has been named HERMES. which name also is that of a Dutch Diesel-driven tanker owned by the Anglo Saxon Petroleum Company. Twin 6-cylinder A. E. G. Burmeister & Wain 500 b.h.p. Diesel engines are being installed and are expected to give the vesesl a speed of 13¾ knots. The hull has the following dimensions: 132′ x 27′ 6″ x 16′ 3″. The HERMES is very completely fitted out with electric winches, wireless and salvage equipment, as in addition to her towing work she will be used as a salvage vessel.

CYLINDER WEAR AFTER NINE YEARS' SERVICE

A visit to the East Asiatic Co.'s nine year old 3,200 horsepower 9,209 tons d.w. motorship SIAM was made during December by an editorial representative of the Liverpool Journal of Commerce. For the purpose of survey and inspection the engine-room crew had drawn a cylinder-liner and a piston. The latter and its rings were in excellent condition, while the 23.228″ diameter liner had only worn 0.5 mm. at the bottom and 1.5 mm. at the top. The piston stroke is 31.496″. Although the exhaust valves will run for longer periods, they are usually changed for re-grinding after every 35 days running time, this depending upon the amount of water and sulphur in the fuel. Each of the Burmeister & Wain four-cycle Diesel engines has eight cylinders, and develops 1,600 i.h.p. at 125 r.p.m. The two engines together burn 10½ tons of fuel daily, and give the SIAM a speed of 11¼ knots. Differing from most B. & W. engines, there is but one fuel pump for each set of four cylinders, the latter having a distributor feed, while the pump valves are controlled by an Aspinall governor.

CURRENT REVIEW

Werkspoor Marine Diesel-Engines, and *Eleven Years Operation of First Motorship*. Two pamphlets issued by Werkspoor, Amsterdam, Holland, October, 1922. The latter of these pamphlets is a reprint of the article on the operation of the VULCANUS which appeared in the October, 1922, issue of MOTORSHIP, while the first illustrates some of the large ocean-going motorships powered with Werkspoor Diesel-engines and contains a table graphically showing the number of motorships in actual service which are powered with engines of over 1,000 brake h.p. In addition to the 23 ships on this table there are 18 smaller motorships powered with Werkspoor Diesel-engines. Obtainable from the New York office at 233 Broadway.

WERKSPOOR DIESEL-TUG ORDERED

A 200 shaft h.p. Werkspoor Diesel-engine has been ordered from the Pacific Diesel Engine Co. of Oakland, Calif. by Young & Gore of Vancouver, B. C. for installation in an 85 ft. tug. Further details will appear later.

CLASSIFIED ADVERTISEMENTS

FOR SALE

Pair of 3,000 B. H. P. 10 cylinder, M. A. N. Diesel Engines and 4 tandom Generators, suitable for same, similar to those fitted in the Hamburg-America Line's M. S. "Havelland" and "Musterland." Apply Batchelor Clinkham Works, Halling, Kent, England.

ENGINEERING EXECUTIVE

—Twenty-two years' experience, of which fifteen in Diesel design and installations and specialized navy practice. Can take full charge of production or design and installation for Shipyards, Engine Builders or Shipowners both technical and business; used to handling large forces of men. Available in February. Address Diesel Executive, care MOTORSHIP.

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Our Readers' Opinions

(The publication of letters does not necessarily imply Editorial endorsement of opinions expressed)

SCIENCE AND PRACTICE IN DIESEL DESIGN

The Editor of MOTORSHIP:

As a student of Diesel engineering it occurs to me that theory of design differs from results in practice, and that scientific reasonings are not always good leads for engineers to follow. Before a British engineering society Professor W. H. Watkinson recently stated—"he thought that the two-stroke cycle had a better opportunity of getting a higher efficiency than the four-stroke. In the Cammellaird-Fullager engine the frictional resistances were reduced to a minimum because the scavenge pump was attached to the main cylinder. Those who had experience with 4-cycle engines knew, to their cost, that the main trouble with this engine was in connection with the exhaust valve. It was well-known that a good deal of time had to be spent in re-grinding these valves, and occasionally a valve had a piece burned out of it, which was not so in the case of the two-stroke cycle engine."

Professor Watkinson also said that—"he had referred to heat stresses in connection with the two-cycle and four-cycle engine. Some experiments had been made regarding the rate of heat flow in certain engines, and in the case of a German submarine the maximum heat flow in the liner was 25,500 b.t.u. per square foot per hour and in the head 67,000 b.t.u. per square foot per hour. In another case the maximum heat flow was 11,000 b.t.u. in the liner and in the head 32,000 b.t.u. In the case of a two-stroke cycle engine rated at 140 i.h.p. per square foot piston area the maximum flux in the liner was 20,500 b.t.u. and in the cover 55,000 b.t.u. per square foot per hour. If they had an opposed-piston engine they only had the liner stresses and not the head stresses. In the opposed-piston engine of equal power at equal speed the flux through the liner was very much less. It was only 0.57 of the flux through the head in a single-piston two-cycle engine, so that when experience had been gained of the design and manufacture of these liners it seemed that far less trouble would be caused due to cracks than in the case of four-cycle engines, where they had an exceedingly complicated cylinder head casting. It seemed certain that in this case the liability to cracks due to great heat flux was not so great in the opposed-piston engine.

But I couldn't stop a sneaking smile because just about the time the learned professor was making the foregoing remarks a British motorship was reported as having arrived at her home port with one of the cylinder-liners of her opposed-piston oil-engine cracked, following a round trans-atlantic voyage.

This is in no wise intended to be a "knock" at any type of oil-engine, but an endeavor to be properly posted, and to express doubts that college professors know as much about oil-engines as men who work on them all day. What they say sounds a lot but doesn't mean much. However, is it not true that the early marine-type opposed-piston engines built in Germany before the War by the Weser and Frerichs companies suffered from cylinder cracks due to no allowance having been made by Junkers (another professor) for the unequal expansion forces brought about by the big bosses cast on the tubular cylinders for the fuel, starting and blow-off valves? And, that in one case steel bands were hot-shrunk on the cylinders to keep the cracks from extending to a dangerous degree.

Then again, is it correct that the lubricating-oil pressure in the Sulzer single-acting marine Diesel engine is about 750 lbs. per sq. inch, but only about 12 lbs. in the Cammellaird-Fullagar opposed piston oil-engine as stated at the same meeting? If so why such a great difference? I refer to the lubrication of the main and big-end bearings.

G. E. BRADDOCK,

Boston, Mass.

UTILIZATION OF EXHAUST GASES

The Editor of MOTORSHIP:

Referring to the article in your October 1922 issue on the "Utilization of Exhaust Gases," by S. Snuyff, and to that on the same subject in the January, 1923, issue by Mr. J. L. Chaloner, I was very much pleased upon reading them inasmuch as the authors have undertaken the tapping of a field which will become of more importance as the development of the motorship progresses.

In this connection I would mention that the Navy Department has had to make use of much of the waste heat in their submarine engines due to limitations of space and weight both for heating purposes and for the production of distilled water for use in storage batteries and for drinking and cooking purposes.

I am not at liberty to dwell at length upon this subject on account of the fact that all investigations along this line undertaken by and for the Navy Department are of a confidential nature.

J. BARRAJA-FRAUENFELDER.
Chief-Engineer,
The Lake Torpedo Boat Co.,
Bridgeport, Conn.

To the Editor of MOTORSHIP:

Having investigated the question of exhaust-gas utilization on a rather extensive scale I read with interest the article about the Still engine in your issue of April last. It is claimed that the total M.E.P. being 90.31 pounds and the internal comb. M.E.P. 80.5 the gain from exhaust (waste) heat is about 12.3 per cent on a I.H.P. basis, which result fairly coincides with the outcome of my calculations in connection with the application of exhaust heat utilization with four-stroke engines, as published in your issue of October, 1922.

It is, however, reported in the story about the Still experiments, that the quantity of steam generated from waste heat is 800 pounds per hour at 120 pounds pressure per square inch. This means that the steam consumption of the steam-part of the engine is about 800:36=22.2 pounds per B.H.P. This in itself is not unusual (though rather much), but the great quantity of steam available seems rather strange.

I computed with my four-stroke engine at most favorable conditions (a boiler-efficiency of 66 per cent.) a total of 30.4 per cent (of fuel heat) available for the steam engine (feed-water heating and super-heating included), thereby assuming that in the gases from the engine still 46 per cent of the original heat was present.

Accepting the ratio of 800 pounds for a 345-B.H.P. engine, as published with the Still engine, to be correct, this would mean a heat ratio of about 38-40 per cent available for the engine, corresponding to a boiler efficiency of about 80-87 per cent. This seems too high and some elucidation on this point would be advantageous.

S. SNUYFF.

Zandvoort, Holland.

McINTOSH & SEYMOUR DIESELS OF THE "MUNMOTOR"

TO THE EDITOR OF MOTORSHIP:

Referring to your letter of December 30, 1922, directed to the Munson Lines, attention of the Superintending Engineer, regarding MUNMOTOR, please be advised that the Diesel engine installed in this vessel behaved wonderfully well during the very severe weather conditions suffered by the MUNMOTOR and that while the vessel shipped heavy seas over her decks, her deck fittings being washed away and vessel more or less waterlogged, and was compelled to run before the gale before being able to straighten herself up, she finally proceeded to her port of discharge—Boston—with her cargo intact and her engines functioning well.

We are very much pleased with the performance of this vessel in this extremely bad weather condition.

F. C. Osborn,
Manager, Ownership Operations,
Maintenance, Equipment & Personnel,
Munson Steamship Line,
N. Y. C.

WANT TWO 4,000 TON MOTORSHIPS

TO THE EDITOR OF MOTORSHIP:

We will be in the market for two motor cargo ships capable of loading 4,000 tons zinc concentrate, within the next two months.

The ships we want must have a steel hull, and insurance must not be excessive. They are wanted to load concentrates at Tampico for Antwerp and Hamburg, and perhaps a port in northern France.

We will either charter the ships, or contract tonnage at so much per ton. For your information the zinc concentrates are in bulk and weigh as heavy as lead. We will control 4,000 tons monthly, and think it will take two ships to handle the output.

Will you kindly put us in touch with owners of such vessels. Our principles would consider buying if a suitable ship could be offered.

We are shipping now around 3,000 tons per month; but the service is very irregular and the passenger liners do not care much for that kind of cargo.

Fred V. Burns,
Apartado Correo No. 311
Calle Rivera 21—Altos,
Tampico, Mexico.

THIS MAGAZINE IN GERMANY

To the Editor of MOTORSHIP:

I have been impressed with the extraordinary regard in which MOTORSHIP is held on this side of the Atlantic.

JULIUS KUTTNER.
Archaffenburg,
Germany.

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